Established 1916 as
THE OIL WEEKLY

WORLD OIL

Pipe Line Edition

SPECIALIZED FOR EXPLORATION, DRILLING, PRODUCING,
PIPE LINE OPERATIONS AND MANAGEMENT

NOVEMBER, 1953

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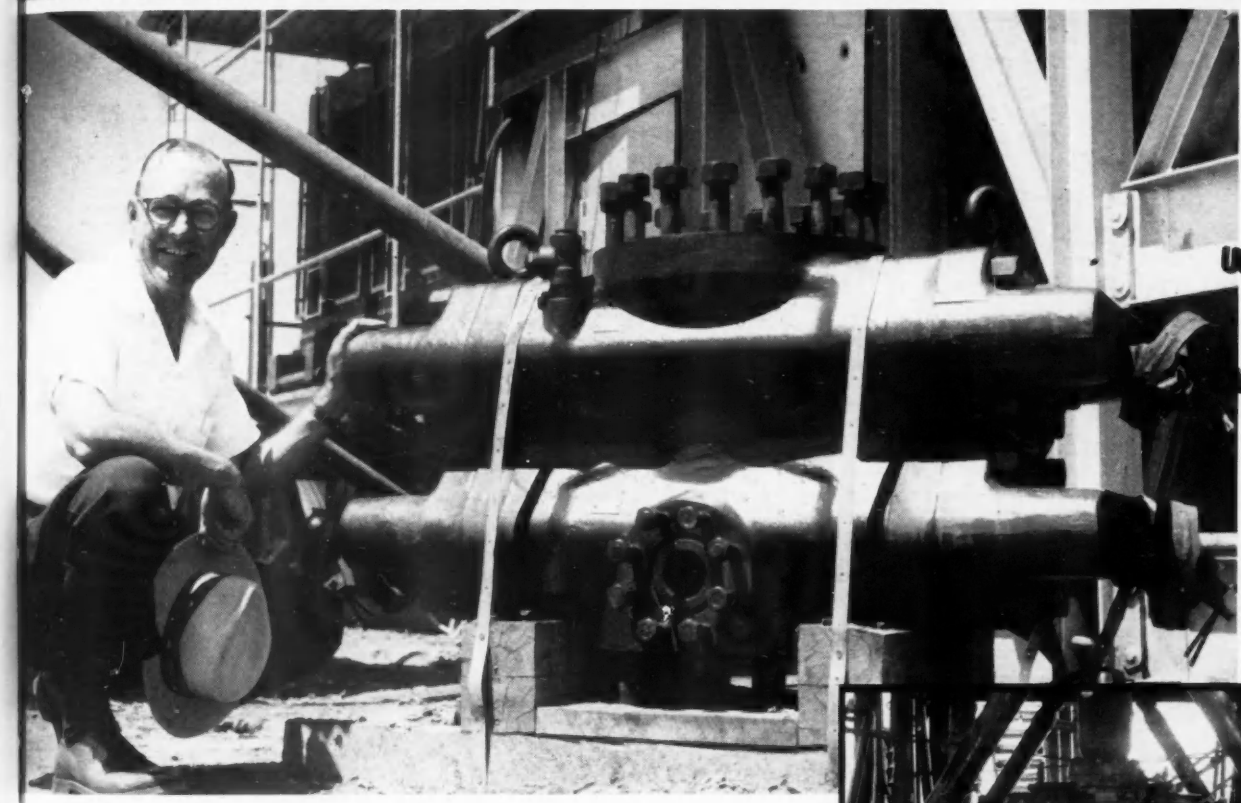

Gene Teer,
Division Sales Manage
West Texas-New
Mexico Division

UNIV. OF MICHIGA
NOV 4 1953
ST ENGINEERIN

AWAY OUT WEST IN TEXAS--
WHERE CELLAR SPACE IS SCARCE

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Complete
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WORLD OIL

Established 1916 as The OIL WEEKLY

VOL. 137, NO. 6

November, 1953

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A Quick Look at This Issue

BUSY OIL MEN: To help you put first things first, scan these time-saving digests on this and the following pages, checking ☐ those you want to read first.

CURRENT OUTLOOK

☐ **Military demand for aviation gasoline** will rise slightly during the next few years. U. S. oil consumption of between 12 million and 14 million barrels daily by 1975 is forecast. For other glances at what lies ahead, see Page 57.

☐ **Have you noticed it?** This is an alphabetized age. WORLD OIL is privileged to display one symbol of which we are particularly proud . . . ABC. What does it mean? What is the purpose of this organization? Publisher Ray L. Dudley explains the Audit Bureau of Circulation. Page 59.

Turn the Page

In Canada . . .

This well drilling in the Success field of southwestern Saskatchewan typifies the continuing search for the medium gravity crude found in the Jurassic formation there. Throughout the prairie provinces, Canada's oil exploration and development is progressing rapidly. New pipe lines, new markets, new fields, and spreading test drilling are reflected in the roundup of articles scheduled for presentation in WORLD OIL's December issue—the Canadian Issue—which will contain a large, colored map insert locating western Canadian oil and gas fields, pipe lines, and refineries.

A QUICK LOOK . . .

☐ **Debate over U. S. imports** of petroleum will grow hotter before it gets cooler. There's a surplus of world oil producing capacity, and it's knocking at U. S. doors. Legal limitation on imports is due to come before Congress again in January. Independent operators in Southwest have been hurt by production cuts. They blame imports, want them curbed. On the other hand, importers say developments of foreign production serves the national welfare. There's no easy solution. But in this issue are some pertinent facts for studying the problem and attempting to do something about it. See **Page 60.**

☐ **No lost-time accidents in eight years.** Old 25, the rig that is never stacked and never moves away, has been cited by the API as the nation's safest. For details of a remarkable safety record and a description of some unusual drilling crews, turn to *Why They Don't Get Hurt on Old Rig 25*, **Page 66.**

☐ **The Big Moment for Frank M. Porter** was his decision to choose between a career in textiles and oil. He didn't know much about the oil business, and the immediate financial prospects were no better. But he couldn't resist the lure of the West. For a capsule narration of what happened from the time he left the East until his return in recent years, see **Page 68.**

☐ **Middle East petroleum now reaches every continent,** and developments in the prolific crude-producing area will bear close attention. They have a significant impact on world oil's basic economics—supply and pricing. See **Page 70.**

☐ **Russia is looking to its tidelands,** too. In fact, the Communists claim that Caspian Sea tidelands' production in the first nine months of 1952 was 25 percent greater than for the corresponding period of the previous year. For this and other details, turn to **Page 77.**

☐ **Economic position improves.** Cautious optimism is replacing the pessimistic feeling of a month ago. Improved stock position gives hope that serious market trouble will be sidestepped this winter. See *Report from the Observatory*, **Page 82.**

EXPLORATION ARTICLES

☐ **Safety starts at the top . . .** A safety director needs the help of high officials and supervisors in planning a program. The party chief ramrods the program among the crews. A committee of workers can point out hazards and help eliminate them. Regular meetings and publicity will keep interest high. These are some of the suggestions in an article that points out that a good safety program must stem from top management. **Page 95.**

☐ **A new oil-finding method** has been tested in the field. While additional studies are needed to evaluate the possibilities and limitations, once established, this method should be a useful tool in exploring for oil accumulations. Beginning on **Page 98,** is a description of the field procedure and reports on experiments in Louisiana and Texas.

DRILLING ARTICLES

☐ **A crisis every 30 minutes! . . .** That's the Clear Creek field of central Utah where the problems are fantastic. It's the U. S.' highest field and has been described as the nation's toughest drilling area. "It's like drilling through a pile of loose stones," is the way one oil man describes it. But the rewards are many. Donald M. Taylor of the WORLD OIL staff will take you on a tour of the area. **Page 115.**

A QUICK LOOK . . .

☐ **Winter's coming! . . .** Preventive maintenance services should be performed on all drilling engines, tractors, and trucks this month. Here are some trouble-shooting ideas and a map showing the lowest mean temperature across the U. S. for November. It's based on U. S. Weather Bureau forecasts. See **Page 120.**

☐ **What should be done to protect engines?** An expert in the field tells you. Preventive maintenance on cooling, lubrication, and fuel systems can be aided by accurate operating and repair records. This article points out the contrast between a "patch-up" and proper overhaul. **Page 122.**

☐ **Improvements in the modern drilling rig** have resulted in fuller use of the installed power, smoother operation, and longer life of the parts connected with the transmission system. Here a development engineer discusses the power transmission requirements on a rotary rig, and the advantages and disadvantages of:

- Friction clutch
- Fluid coupling
- Torque converter
- Eddy-current coupling

See **Page 128.**

☐ **A banker looks at the contracting business . . .** and finds two glaring weaknesses . . . (1) an insatiable desire for more equipment and (2) an inadequate accounting system. **Page 140.**

☐ **A new automatic control for filter presses** promises to solve the problem of scheduling laboratory tests on drilling muds. Adaptable to either the laboratory or the field, this instrument permits maximum use of lab equipment. For a complete description of this new unit, turn to **Page 151.**

☐ **Make rig winterized easier** by using unitized sections. As we've said, winter's at hand and here's another helpful idea to show how unitized sections can facilitate rig winterizing. **Page 152.**

. . . In Louisiana

☐ **Surveying on a marsh buggy** was only one of the means used in staking out Southern Natural Gas Company's new lines. Helicopters were used, too. Major portions of the current $76 million expansion program are being completed this year, the second year of a three-year expansion plan. Delivery capacity will be increased to more than 1 billion cubic feet of gas per day. An unusual part of the program is the new line into the gas-rich marshes and offshore waters of south Louisiana. Some 160 miles of line was laid through water. It's another pipe line feature in this month's special Pipe Line Issue. See **Page 223.**

PRODUCTION ARTICLES

☐ **Three wells in one** is an accurate description of a triple completion made recently by Aluminum Company of America's Mining Division in three separate gas reservoirs. The outstanding feature of this unusual gas well completion was the use of three parallel 1½-inch tubing strings to handle separately gas production from each zone. It's believed to be the first of its kind. For details on how it was done, equipment involved, running-in procedure, and how the well was brought in, read *Triple Completion Takes Parallel Tubing Strings,* **Page 169.**

☐ **Take another look at heating oil emulsions** and check the five important steps to modern treating methods. Here's a down-to-earth discussion of emulsions, their characteristics, and problems in treating them. If you've never seen an emulsion under a microscope, turn to **Page 178** and examine the three microphotographs of typical cases. And there are some suggestions on how to cut treating costs and improve recovery of stock tank oil.

☐ **Setting fire to underground reservoirs** promised to become a new method for recovering thick, heavy crudes which heretofore have been classed as unrecoverable. Researchers at Magnolia Petroleum Company's field research laboratory in Dallas spent six years experimenting and studying the possibilities of injecting air into an input well, setting the formation afire electrically, and producing the oil from offset wells. See **Page 184.**

☐ **Considering an intermittent gas life installation?** Then don't overlook the importance of port sizes in valves. Proper selection of this one item can

A QUICK LOOK . . .

appreciably affect production, efficiency, and valve spacing. For a better understanding of how and why size of gas lift valve ports influences this type of operation, and for some practical factors to consider in selecting port size, turn to **Page 187.**

☐ **Important reading for any supervisor** of oil field personnel is *How You Can Combat Hydrogen Sulfide Hazards.* Because so many accidents have resulted from this deadly gas, few chemical terms are as well known in the field as hydrogen sulfide. It's effect, how to detect it, symptoms of victims, and what to do about this hazard, are discussed in an article beginning on **Page 190.**

☐ **How to solve problems in gas measurement . . .** The on-and-off flow of gas to gas lift wells imposes a hardship on conventional methods for measuring accurately the volume used. If you sell or buy gas for this type of artificial lift, you are interested in an equitable adjustment for this gas. And engineering departments are interested in how much gas is used and how much gas comes from the producing formation. A comprehensive study of the problem has been made. See **Page 194.**

PIPE LINE ARTICLES

☐ **Save $20 per horsepower** in initial compressor station outlay and save on maintenance and operating costs, too. That's what Texas Gas Transmission Corporation has done by adding unitized drives to engines so that each engine drives its own auxiliaries. In addition, the new system has improved temperature control of jacket water. **Page 230.**

☐ **Solve pipe line problems with electronics . . .** that's what Midwest Research Institute is doing. An electronic analyzer makes short work of such problems as compressible flow analysis, network analysis, and economic problems that beset the industry. See **Page 238.**

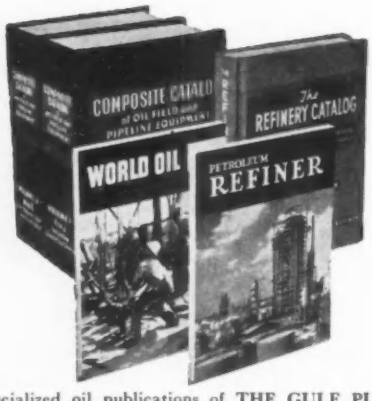
☐ **Designed for easy expansion . . .** that's a trait of the new products system of The Buckeye Pipe Line Company. Much equipment and many parts can be interchanged, and the system capacity can be increased at a minimum cost. **Page 246.**

INTERNATIONAL ARTICLES

☐ **Peru has blazed a trail . . .** in the current day of foreign aid and nationalism. The nation has found that progress lies along the trail which can be traveled profitably. See **Page 275.**

☐ **Canadian tankers are still busy . . .** Before year's end, Canada's booming oil industry will have occasioned the building of more than 3000 miles of pipe lines. While this program has resulted in abandonment of some old tanker water routes and dislocation of others, jobs aplenty are being found for tankers. See **Page 278.**

☐ **When East meets West** there's quite a contrast . . . especially out in the broad expanses of the Arabian desert. Turn to **Page 284** and read how the Saudi Arabian government railroad has increased the Saudi transportation speed about 86 miles per hour . . . at least in comparison to the camel.



Specialized oil publications of **THE GULF PUBLISHING COMPANY,** 3301 Buffalo Drive, Houston 6, Texas; Box 2608, Houston 1, Texas.

WORLD OIL and **THE COMPOSITE CATALOG** for the drilling-producing-pipe line industry.
PETROLEUM REFINER and **THE REFINERY CATALOG** for the refining-natural gasoline-petrochemical industry.

RAY L. DUDLEY, President, Publisher
A. L. BURNS, Vice President, General Manager

ABC

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Indexed by Industrial Arts Index and Engineering Index

Looking Ahead . . .

. . . **Military demand for aviation gasoline will increase slightly** for the next few years, but it will be exceeded by military use of jet fuel by end of 1954. Commercial demand for aviation gasoline will continue to increase gradually until jet engines begin to replace reciprocating engines. Jet planes will be in some service commercially by 1960 and in wide use by 1965. Present grades of lubricants will increase in use for the next several years, but synthetic lubricants will become increasingly essential, as they will have to replace present products in lubricating future jet planes. So predicts Lt. Gen. James H. Doolittle, famous flyer, and Shell Oil Company vice president.

. . . **Yellowstone Pipe Line Company's 544-mile products line** from Billings, Montana, to Spokane, Washington, will be built between next spring and next August. Completion date was postponed from next January to avoid high winter costs. Line will move products from Billings refineries of Continental and Carter oil companies.

. . . **Long, slender television cameras are envisioned as future devices** for seeing what is going on inside a well as drilling proceeds. It would save time and money in fishing jobs, and would permit continuous viewing of the walls of the well and the formations penetrated. This camera would be an improvement over the still camera already in use.

. . . **Military petroleum products storage will be partially solved** by the close of the first quarter of 1954. According to the Armed Services Petroleum Purchasing Agency, additional storage space for five million barrels is expected to be completed by then, in addition to the terminal building program currently under way.

. . . **U. S. oil consumption of between 12 million and 14 million barrels daily** by 1975 is forecast by Texas Railroad Commission Chairman Ernest O. Thompson. Basing his estimate on past increase in consumption and a projected population increase, Thompson said the increased requirements would result from new discoveries, improved recovery methods, secondary recovery, growing use of butanes and propanes as motor fuels, conversion of gasoline from natural gas, and imports.

. . **Initial report of the new API committee** established to examine the continuing problems of reducing petroleum liquid losses by evaporation will be made November 9.

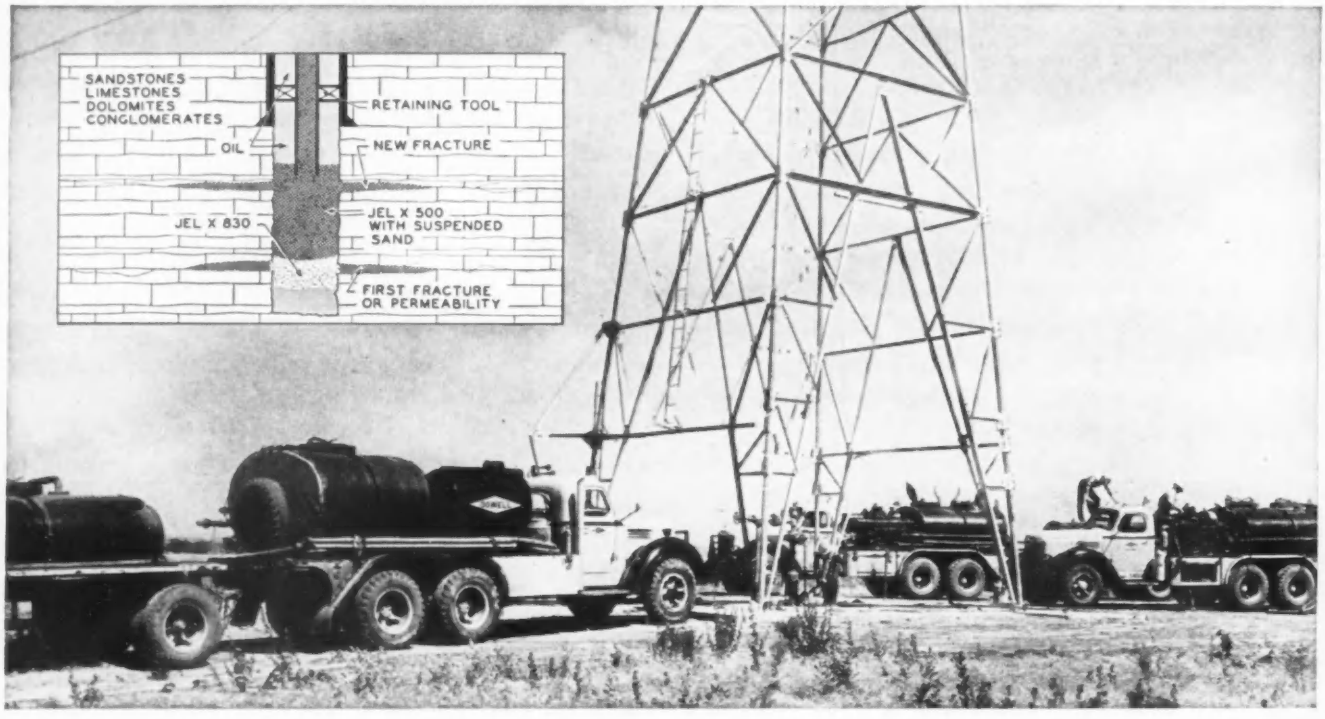
. . . **A total demand hike of 4 percent for petroleum products in 1954** is expected by one Bureau of Mines forecaster. He said this figure is preliminary, pointing out that the official bureau 1954 forecast will be made in December.

. . . **Turkish national assembly is scheduled to vote** on the nation's new oil law in November. The proposal has been drawn up by Consultants Max W. Ball and Elmer E. Batzell.

. . . **Fuller utilization of large diameter pipe lines** into the densely-populated areas and use of smaller diameter lines to distribute products into the more remote consuming areas is forecast by Herbert E. Fisher, managing director, C.R.C. Engineering Company, Houston, and Kaneb Pipe Line Company president. Two reasons cited: cost and savings.

FIXAFRAC—TEMPORARY PLUGGING SERVICE—AIDS IN MULTIPLE FRACTURING TREATMENT

Production boosted from 2.3 to 65 BOPD; Fixafrac used to divert Stratafrac stages into different zones



Initial production from this well, after acidizing, was 50 barrels of oil per day. It declined over an 18-year period until production had fallen to 2.3 BOPD.

At this point, the operator decided to call in Dowell to determine how to increase production. Dowell's recommendation: a multiple fracturing treatment consisting of 1500 gallons of Stratafrac material and 300 gallons of Fixafrac material.

Dowell engineers performed the service, using Dowell trucks, equipment and fracturing materials. As a result of the treatment, the well swabbed 3½ barrels of oil per hour for 7 hours, after treating materials had been recovered. On pump, the well produced 65 BOPD.

Fixafrac is a temporary plugging service used between stages of Dowell fracturing and acidizing treatments to divert treating fluids into different sections. The material used in Fixafrac service, Jel X 830, carries suspended solids which react after treatment causing the material to liquefy and flow back freely to the well bore. No jel-breaker solution is needed following the treatment.

If you would like to know more about Fixafrac service, or any of the many other Dowell oilfield services, call the nearest Dowell office or write to Tulsa, Dept. K-13.

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FOR OIL INDUSTRY CHEMICAL SERVICE

Have You Noticed It?

ON PAGE 4 of WORLD OIL is a set of initials white on a black background, "ABC." Like a lot of things which one gets accustomed to seeing, they are seen but probably not understood, by the more than 22,000 subscribers to WORLD OIL.

What does "ABC" mean? It means that WORLD OIL is a member of an organization known as the Audit Bureau of Circulations and that it has voluntarily agreed to and pays for an audit of its circulation records each year which is as tough or tougher than most bank audits!

Every industry has its peculiar set of economics and those of the publishing industry are peculiarly peculiar! The cost of gathering the information, printing and mailing it in publication form, in a publication like WORLD OIL, runs into a lot of dollars per year.

In the early days of periodicals, the subscriber paid the entire cost, plus a profit to the publisher. Then as time went on, individuals or companies with something to sell realized that they could announce those products for sale in the publications and thereby sell more.

And so advertising entered the scene. After a while the publishers discovered that the more people they had reading their publications, the more advertising they could carry, the greater the price they could get for their advertising, and finally it grew to the point where advertisers paid most of the costs and subscription prices took a terrific tumble.

This was true 40 or 50 years ago just as it is true today. The subscriber pays only a small part of the cost of producing the publication. The advertiser who wants to "talk to the subscribers" through the publication's advertising columns pays the balance. Since not only advertising volume but advertising rates were based on subscriptions and since advertisers felt that paid subscriptions were better than "give away copies," every publisher came to feel that he had a stake in a large paid circulation and every advertiser felt that he had a stake in making sure the circulation was "as claimed."

So a racket arose! One of the things which could be checked was press runs and paper purchases, so some publications, notably newspapers in certain points, printed the number of copies they claimed and then couldn't get rid of them. There is the story of boatloads of papers being taken out and dumped into a certain large lake. There are stories of barns being filled with undelivered newspapers.

Because there were dishonest as well as honest pubishers, just as there have been known to be dishonest as well as honest bankers, the publishing business was pretty much in the same shape that the banking business was in before the government put around it the safe-guards of bank examinations.

So around four decades ago, out of this chaos the Audit Bureau of Circulations arose. It was sponsored jointly by honest publishers, and concerns that spent a lot of money for advertising. Most of the financial burden of the examinations was put on the publishers, although the advertisers made a contribution. The board of directors was, as it should have been, dominated by advertisers but publishers had representation on it.

Before long, a publication had to belong to the Audit Bureau of Circulation if its claim to paid circulation was to be regarded by the advertiser.

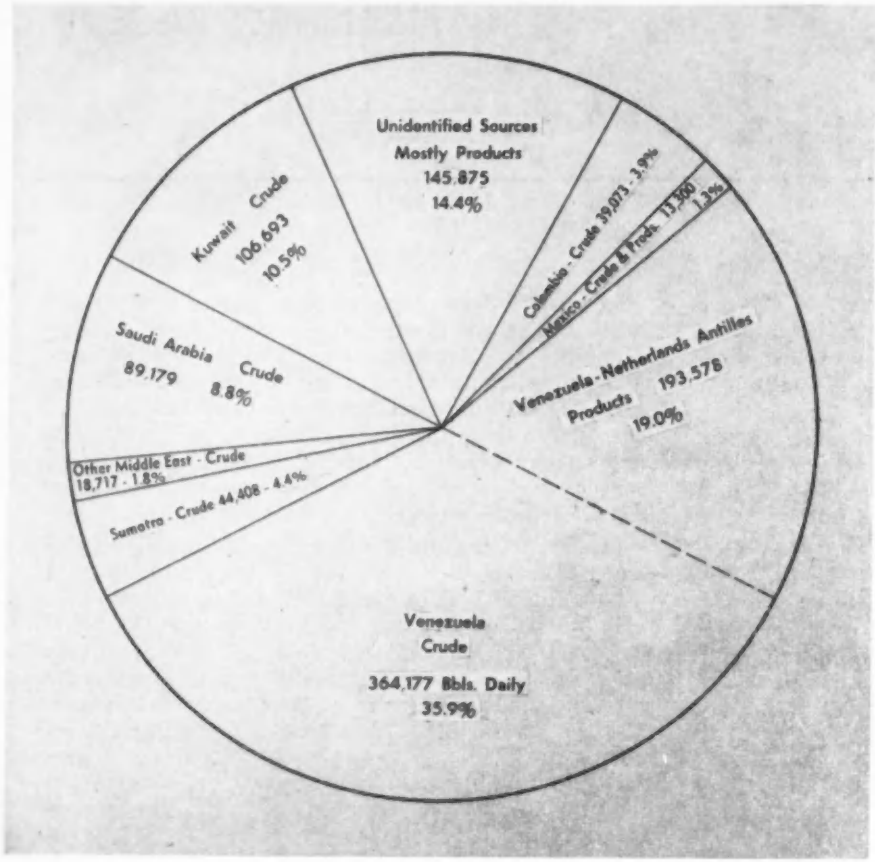
The examination by a highly competent ABC auditor is a thorough thing. Even the envelopes carrying the subscriptions to WORLD OIL must be preserved along with the subscription order. Funds must check out exactly. Pressruns and paper purchases must check out. The bookkeeping procedure in the circulation department must be in accordance with ABC approval. If ABC thinks that a publisher is "faking" some circulation, it can send out, at the expense of the publisher, as many letters as it desires to subscribers asking about the origin of the subscriptions and if the replies show that chicanery has been engaged in, drastic cuts in the circulation statement can be made.

Subscriptions under Audit Bureau of Circulations Rules are divided into various classifications, those sent in by the subscriber himself, those taken out by a company for its employes is another, those sent in by subscription agencies form still another, subscriptions taken out and paid for by a company unrelated to the subscriber forms still another, and woe to the publisher that tries to get "slick." Even the positions held by subscribers to business publications must be shown on the subscription records which are audited by ABC.

What happens when ABC finds that a publisher has been deliberately falsifying his statements? In all of our recollection of the ABC and business publications there is only one instance that we recall of such an abuse by a publisher, though there may have been others. In that particular instance, we heard that the violation was flagrant. It happened a long time ago in the early days of ABC and served as a splendid example. The publisher was given a choice of disposing of his publication immediately or of facing a charge of perjury. At least, that was what the grapevine said. The publication changed hands and shortly went out of business.

WORLD OIL is proud to be a member of the Audit Bureau of Circulations and to carry the symbol of membership on its masthead page.

Ray L. Dudley



Source: Texas Railroad Commission

FIGURE 1
U. S. Imports of Crude and Refined Oils in September 1953, by Sources (Excl. Bonded Oils). Barrels Daily. Total 1,015,000; Crude, 672,000; Products 343,000.

Imports a Growing Problem for U. S.

- Independent operators demand restrictions.
- Importers claim their operations are serving the national welfare.
- Solutions other than curbing shipments, include finding new uses for petroleum, expansion of U. S. economy, and promoting use of more oil abroad.

By L. J. LOGAN, WORLD OIL Staff

AGITATION FOR restricting U. S. oil imports currently is strong. It will increase when Congress convenes next January. Unofficially, if not officially, the subject will be debated hotly at the forthcoming annual meeting of the American Petroleum Institute. It is a question that threatens to divide and impair the industry, pitting independent operators against major companies that bring in foreign oils.

There is a surplus of world oil producing capacity, and it is knocking at U. S. doors. Venezuela and Colombia are becoming increasingly dependent upon the U. S. for markets, since they have lost traditional markets in Europe and Canada to Middle Eastern and Canadian suppliers of crude.

The Middle East countries have largely taken over the supplying of Western Europe and Northern Africa, as well as some markets in Asia, and have been supplying increasing volumes to the East and West Coasts of the U. S.

Shipments to the U. S. help to maintain production and royalty payments to the governments of the Caribbean and Middle East countries, and thus are a factor in avoiding trouble in holding the concessions.

Crude has been coming to the U. S. West Coast from Sumatra in the Far East, as well as from Venezuela and elsewhere, to relieve a West Coast shortage. But the shortage now is ending, and plans for curtailing imports into California have been announced.

Hurt by recent cuts in production allowables in Texas, Louisiana, Oklahoma, Kansas, and elsewhere, independent operators blame imports and want them curbed. Representatives of the governments of those states also are critical of oil imports, because higher imports may mean lower domestic production and loss of revenue from taxes on the production.

Losing markets to oil and natural gas, U. S. coal producers and coal miners condemn imports of fuel oil and crude petroleum. They join with independent oil producers in demanding legal limitations on petroleum imports.

Hazards Great. Holding large investments in foreign fields, where the landowner governments demand steady production and steady royalties, importing companies must draw to some extent on those sources or risk trouble in holding their concessions. The hazards are twofold and great. The properties could be lost to the companies and as possible sources for U. S. national defense by either nationalization, as in Iran, or by switching of the countries involved into the Soviet orbit. The U. S. oil importers assert that their development of foreign fields and their importation of some of the oil produced

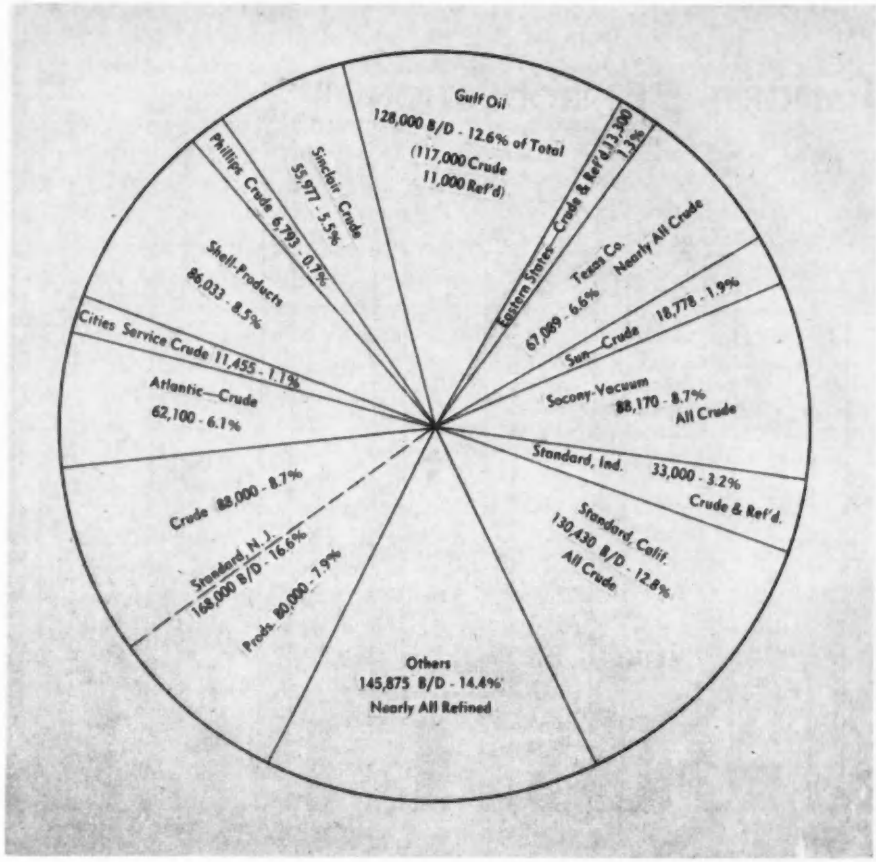
is in the national interest, providing supplementary sources for U. S. oil needs, helping the foreign countries concerned, and keeping the foreign oil resources out of unfriendly hands.

Some U. S. government officials and members of Congress are sympathetic with independent producers and the coal people but at the same time are reluctant to limit imports because of possible ill effects on international trade, international political relations, and the national welfare. Without the dollars that they get for oil sold into U. S. markets, Venezuela, Colombia, Saudi Arabia, Sumatra, and other oil producing countries could not buy American automobiles, machinery, cotton, and other exports; and American manufacturers and farmers would lose markets. Forced to sell their oil elsewhere, the oil exporting countries would likewise buy goods from the other countries. Furthermore, in order to get markets, the oil exporting countries might be obliged to cut prices and thus drag down oil prices in the world markets and in the U. S.

No Easy Solution. There is no easy solution to this increasingly vexatious problem of petroleum imports. But herewith are presented some of the pertinent facts and figures on the subject, which may aid in understanding the situation and doing something constructive about it.

As shown in Table 2 and Figures 3, 4, and 5, imports have developed into a modern times problem only since World War II. In 1946 and 1947 imports were less than exports. (Table 2 and Figures 3 and 5.) The U. S. was a net exporter of petroleum. Subsequently, imports have steadily increased, and exports have decreased, as foreign fields and refineries have become suppliers of more markets. In 1953 U. S. total imports will average about 1,068,000 barrels daily, compared with only 377,000 daily in 1946, while exports of 386,000 daily will be less than the 419,000 of 1946. (Figure 3.)

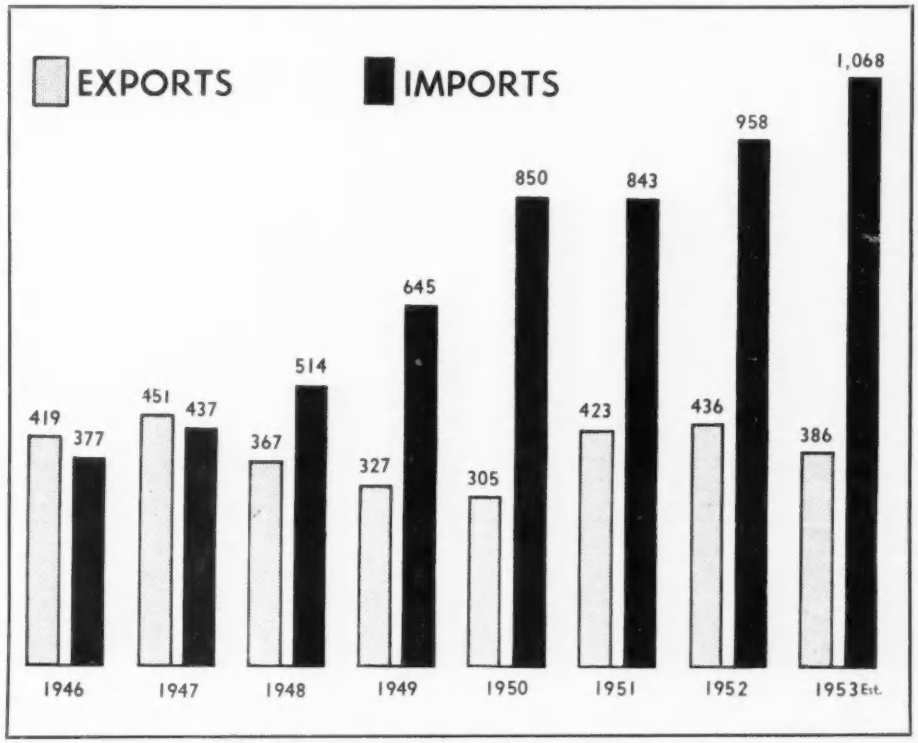
In 1946 and 1947 U. S. net consumption of all oils was more than fully supplied by domestic production, as exports exceeded imports. (Table 2 and Figure 5.) But in 1948 domestic consumption exceeded domestic production of all oils, and 2.5 percent of requirements were supplied by net imports, with the imports 147,000 barrels a day greater than exports. The


Gulf Oil
128,000 B/D - 12.6% of Total
(117,000 Crude
11,000 Ref'd)
Eastern States—Crude & Ref'd 13,300 - 1.3%
Texas Co. 67,099 - 6.6% Nearly All Crude
Sun—Crude 18,778 - 1.9%
Socony-Vacuum 88,170 - 8.7% All Crude
Standard, Ind. 33,000 - 3.2% Crude & Ref'd.
Standard, Calif. 130,430 B/D - 12.8% All Crude
Others
145,875 B/D - 14.4%
Nearly All Refined
Crude 88,000 - 8.7%
Standard, N. J. 168,000 B/D - 16.6%
Prods. 80,000 - 7.9%
Atlantic—Crude 62,100 - 6.1%
Cities Service Crude 11,455 - 1.1%
Shell-Products 86,033 - 8.5%
Phillips Crude 6,793 - 0.7%
Sinclair Crude 55,977 - 5.5%

Source: Texas Railroad Commission

FIGURE 2

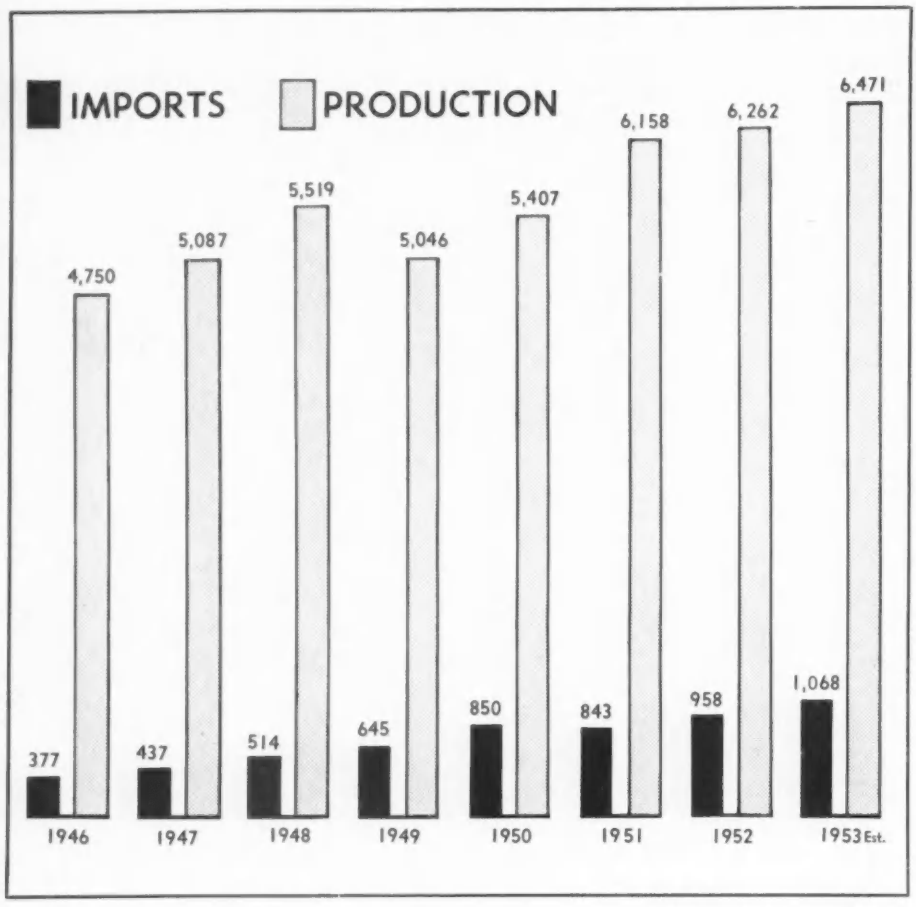
U. S. Imports of Crude and Refined Oils in September 1953, by Companies (Excl. Bonded Oils). Barrels Daily. Total 1,015,000; Crude, 672,000; Products, 343,000.



Source: U. S. Bureau of Mines

FIGURE 3

U. S. Total Oil Imports and Exports—Thousands of Barrels Daily.



Source: U. S. Bureau of Mines

FIGURE 4

U. S. Crude Production and Imports of Crude and Refined Oils—Thousands of Barrels Daily

TABLE 1

U. S. Petroleum Imports in September, 1953, by Sources and by Companies (Excl. Bonded Oils)

(Source: Texas Railroad Commission)

BARRELS DAILY

SOURCE OR COMPANY	Crude	Products	Total	Percent of U.S. Total
SOURCE:				
Western Hemisphere	407,050	203,078	610,128	60.1
Venezuela—Netherlands Antilles	364,177	193,578	557,755	54.9
Colombia	39,073	.....	39,073	3.9
Mexico	3,800	9,500	13,300	1.3
Middle East	214,589	.....	214,589	21.1
Kuwait	106,693	.....	106,693	10.5
Saudi Arabia	89,179	.....	89,179	8.8
Other Middle East	18,717	.....	18,717	1.8
Far East (Sumatra)	44,408	.....	44,408	4.4
Source Unidentified	5,953	139,922	145,875	14.4
Total, All Sources	672,000	343,000	1,015,000	100.0
COMPANY:				
Atlantic Refining Company	62,100	.....	62,100	6.1
Cities Service Company	11,455	.....	11,455	1.1
Eastern State Petroleum Company	3,800	9,500	13,300	1.3
Gulf Oil Corporation	117,000	11,000	128,000	12.6
Phillips Petroleum Company	6,793	.....	6,793	0.7
Shell Companies, Excl. Bonded Fuel Oil	.....	86,033	86,033	8.5
Sinclair Oil Corporation	55,977	.....	55,977	5.5
Socony-Vacuum Oil Company	88,170	.....	88,170	8.7
Standard Oil Company of California	130,430	.....	130,430	12.8
Standard Oil Company (Indiana)	19,910	13,090	33,000	3.2
Standard Oil Company (New Jersey)	88,000	80,000	168,000	16.6
Sun Oil Company	18,778	.....	18,778	1.9
The Texas Company	63,634	3,455	67,089	6.6
Others	5,953	139,922	145,875	14.4
Total All Companies	672,000	343,000	1,015,000	100.0

proportion of domestic requirements supplied by net imports subsequently increased steadily to 5.5 percent in 1949, 8.4 percent in 1950, dropped to 6.0 percent in 1951, then resumed the rise to 7.2 percent in 1952, and will be at a new high of 8.8 percent in 1953. Domestic consumption of 7,732,000 barrels daily will be supplied by net imports to the extent of 682,000 barrels daily, imports being estimated at 1,068,000 barrels daily and exports at 386,000.

Demand Up. While net imports have increased steadily and sharply, U. S. demand has been climbing to very great proportions, and U. S. production also has been steadily increasing to new all time high levels. (Figure 4.) Those seeking to justify imports say that while imports are large, they still are moderate in relation to the very great demand; that there is nothing alarming about supplying at present 8.8 percent of domestic demand by net imports. (Table 2 and Figure 5.) Whether this 8.8 percent constitutes "supplementing" or "supplanting" domestic oil is a question now being debated.

Especially significant among the facts about imports as presented in the tables and charts herewith is the fact that currently over 60 percent of U. S. petroleum imports come from Western Hemisphere countries. (Tables 1 and 4 and Figure 1.) They are our next-door neighbors, over whose welfare we are especially solicitous, and they are sources of foreign oil most accessible in time of war. Over 55 percent comes from Venezuela and the Netherlands Antilles, about 4 percent from Colombia, and over 1 percent from Mexico. The total imports from Western Hemisphere sources in September, 1953, averaged in excess of 610,128 barrels daily (some imports being unidentified as to source). That included 557,755 barrels a day of crude and products from Venezuela and the Netherlands Antilles, 39,073 daily from Colombia, and 13,300 daily from Mexico.

Middle East Oil. The Middle East has become an increasingly important supplier of crude to the U. S. In September of this year it supplied over 214,589 barrels daily, or 21.1 percent of all imports. This included 106,693 barrels a day (10.5 percent) from Kuwait, 89,179 daily or 8.8 percent

from Saudi Arabia, and 18,717 barrels or 1.8 percent from unidentified Middle East sources.

Sumatra in the Far East in September, 1953, supplied 44,408 barrels of crude daily or 4.4 percent of U. S. total imports. The oil was imported by Standard Oil Company of California and The Texas Company in supplying the West Coast region of the U. S.

TABLE 2

U. S. Domestic Consumption of All Oils and Percent Supplied by Net Imports

(Excess of Imports Over Exports. Data from U. S. Bureau of Mines)

THOUSANDS OF BARRELS DAILY

YEAR	Domestic Consumption of All Oils	Net Import of All Oils (Imports Less Exports)	Net Oil Imports as Percent of Domestic Consumption
1946	4,912	(—)42*	0*
1947	5,451	(—)14*	0*
1948	5,775	147	2.5
1949	5,803	318	5.5
1950	6,507	545	8.4
1951	7,053	420	6.0
1952	7,281	522	7.2
1953	†7,732	†682	8.8

* Excess of exports over imports.
† Forecast.

U. S. imports in September, 1953, also included 145,875 barrels a day, or 14.4 percent of the total, unidentified here as to source or importing companies, nearly all of that having been refined products and apparently having been imported largely by independent refiners and marketers.

Who Imports Oil. Petroleum currently is being imported into the U. S. by a dozen major companies and some independent refiners and marketers. (Tables 1 and 4 and Figure 2.) Largest importer, as well as the largest U. S. oil company, is Standard Oil Company (N. J.). Its 168,000 barrels a day of imports of crude and products in September constituted 16.6 percent of total U. S. oil imports. Standard Oil Company of California was second largest importer, bringing in 130,430 barrels daily or 12.8 percent of the U. S. total. Gulf Oil Corporation was third, importing 128,000 barrels daily or 12.6 percent. Socony-Vacuum Oil Company was fourth; it imported 88,170 barrels daily or 8.7 percent. The Shell companies together ranked fifth among importers, bringing in 86,033 barrels daily, exclusive of bonded fuel oil, or 8.5 percent of the national total.

Sixth was The Texas Company, which imported 67,089 barrels daily or 6.6 percent. Seventh place was occupied by the Atlantic Refining Company, importing 62,100 barrels daily

TABLE 3

U. S. Imports of Crude Petroleum in 1952, By Sources

(Data from U. S. Bureau of Mines publication, "International Petroleum Trade," August, 1953, Page 94)

BARRELS

FROM	Total	Daily
Total, All Sources	**209,591,000**	**572,653**
Western Hemisphere	**147,771,000**	**403,746**
Mexico	8,483,000	23,178
Venezuela & Netherlands Antilles	121,963,000	333,232
Colombia	16,209,000	44,287
Other Western Hemisphere	1,116,000	3,049
Eastern Hemisphere	**61,820,000**	**168,907**
Iraq	705,000	1,926
Persian Gulf	55,851,000	152,598
Indonesia, British Borneo, New Guinea	5,264,000	14,383

TABLE 4

U. S. Imports of Crude Oil and Refined Products, by Companies and Kinds of Oil, by Months, 1953-1954

(Source: Monthly Reports of Importing Companies to Texas Railroad Commission)

BARRELS DAILY

COMPANY, KIND OF OIL, AND SOURCE	1953											1954	
	February	March	April	May	June	July	August	September	October Estimate	November Estimate	December Estimate	January Estimate	February Estimate
Atlantic Refining Co., Crude Oil	**55,800**	**51,100**	**55,700**	**62,400**	**67,100**	**53,500**	**73,400**	**62,100**	**64,800**	**64,800**	**64,800**	**64,800**	**64,800**
Colombia, 20°							3,500		800	800	800	800	800
Venezuela, Total	41,600	47,600	43,000	55,700	54,500	40,700	63,300	55,800	56,000	56,000	56,000	56,000	56,000
38-44°	25,100	15,400	16,200	18,700	24,200	19,400	19,400	24,000	23,000	23,000	23,000	23,000	23,000
29-32°	16,500	25,700	20,000	27,100	23,400	11,400	34,000	21,700	26,400	26,400	26,400	26,400	26,400
14-16°		6,500	6,800	9,900	6,900	9,900	9,900	10,100	6,600	6,600	6,600	6,600	6,600
Kuwait, 31°	14,200	3,500	12,700	6,700	12,600	12,800	6,600	6,300	8,000	8,000	8,000	8,000	8,000
Asiatic Pet. Co. (See Shell Co's)													
Cities Service Co., Crude Oil	**5,366**	**9,588**	**3,520**	**12,079**	**10,968**	**8,163**	**8,250**	**11,455**	**5,482**	**8,334**	**11,449**	**8,063**	**11,428**
Venezuela 10.3-17.5°		9,588	3,520	9,787	5,008	4,856	8,250	11,455		5,000	5,805	4,838	5,357
Mexico 11-19.4°	5,366			2,292	5,960	3,307			5,482	3,334	5,644	3,225	6,071
Eastern States Pet Co. Total	**15,000**	**11,492**	**14,480**	**22,700**	**20,000**	**18,700**	**17,350**	**13,300**	**21,500**	**14,000**	**14,000**	**14,000**	**14,000**
Crude Oil, Mexico 9-19°	7,000	3,239	6,713	6,400	10,000	6,500	6,550	3,800	9,500	4,000	4,000	4,000	4,000
Products, Total, Mexico	8,000	8,253	7,767	16,300	10,000	12,200	10,800	9,500	12,000	10,000	10,000	10,000	10,000
Bunker C. Fuel Oil	4,000	1,903	4,545	10,000	6,700	9,000	4,400	6,400	8,000	6,000	6,000	6,000	6,000
Reduced Crude	4,000	6,350	3,222	6,300	3,300	3,200	6,400	3,100	4,000	4,000	4,000	4,000	4,000
Gulf Oil Corp., Total	**96,000**	**148,000**	**99,000**	**115,000**	**140,000**	**113,000**	**110,000**	**128,000**	**105,000**	**111,000**	**102,000**	**121,000**	**94,000**
Crude Oil, Total	82,000	138,000	89,000	97,000	128,000	111,000	90,000	117,000	88,000	97,000	88,000	107,000	79,000
Venezuela, Total	49,000	51,000	51,000	62,000	45,000	36,000	47,000	49,000	49,000	52,000	49,000	57,000	43,000
Above 25°	42,000	41,000	47,000	50,000	34,000	29,000	37,000	42,000	39,000	45,000	39,000	50,000	36,000
Below 25°	7,000	10,000	4,000	12,000	11,000	7,000	10,000	7,000	10,000	7,000	10,000	7,000	7,000
Kuwait, above 25°	33,000	87,000	38,000	35,000	83,000	75,000	43,000	68,000	62,000	56,000	65,000	54,000	67,000
Products, Total Venezuela	14,000	10,000	10,000	18,000	12,000	2,000	20,000	11,000	17,000	14,000	14,000	14,000	15,000
Residual	11,000	10,000	10,000	14,000	10,000		18,000	7,000	13,000	10,000	10,000	10,000	11,000
Gas Oil	3,000			4,000	2,000	2,000	2,000	4,000	4,000	4,000	4,000	4,000	4,000
Phillips Pet. Co., Crude, 43.2° Venezuela	**7,100**	**6,198**	**6,730**	**6,489**	**6,772**	**6,505**	**6,468**	**6,793**	**6,452**	**6,667**	**6,452**	**6,452**	**7,143**
Shell Companies, Products, Total	**182,093**	**144,019**	**120,634**	**85,302**	**102,533**	**88,258**	**56,812**	**103,142**	**149,458**	**163,866**	**182,584**	**192,552**	**176,071**
Asiatic Pet. Co., bonded fuel oil, Neth. Ant.	(7,800	(7,600)	(5,700)	(500)	(110,00)	(11,000)	(5,800)	(13,600)	(2,200)	(10,200)	(7,100)	(7,100)	(7,500)
Shell Caribbean Pet. Co., Resid. fuel oil, Venez., or Neth. Ant. sold to indep. distributors on East Coast	155,000	124,000	104,000	73,000	76,000	65,000	38,000	77,000	135,000	141,000	160,000	169,000	155,000
Shell Oil Corp., Products	19,293	12,419	10,934	11,802	15,533	12,258	13,012	12,542	12,258	12,666	15,484	16,452	13,571
Bunker C. Fuel Oil	14,686	3,774	267	3,194	1,300	3,613	4,335	1,233	3,226	3,333	6,452	6,452	3,571
Bunker C. Fuel Oil, Bonded			(2,767)	(3,323)	(5,433)	(3,419)		(2,376)	(2,258)	(2,333)	(2,258)	(2,258)	(2,500)
Finished Asphalt	4,607	8,645	7,900	5,285	8,800	5,226	8,677	7,800	6,774	7,000	6,774	6,774	7,500
Hvy. Marine Diesel, Bonded								(1,133)				(968)	
Sinclair Oil Corp., Crude Oil	**57,000**	**72,290**	**64,700**	**90,200**	**66,300**	**70,000**	**66,102**	**55,977**	**66,000**	**66,000**	**66,000**	**66,000**	**66,000**
Venezuela 30-35°	52,800	68,355	50,400	72,000	53,900	52,516	58,719	43,162	51,000	51,000	51,000	51,000	51,000
Mexico 25-29°	4,200												
Middle East Total		3,936	14,300	18,200	12,400	17,484	7,383	12,815	15,000	15,000	15,000	15,000	15,000
30-35°			8,500	12,300	8,600	8,323	3,486	12,815	10,000	10,000	10,000	10,000	10,000
36-41°			5,800	5,900	3,800	9,161	3,897		5,000	5,000	5,000	5,000	5,000

■ Continued on Next Page

U. S. Imports of Crude Oil and Refined Products, by Companies and Kinds of Oil, by Months, 1953-1954 *(Continued)*

COMPANY, KIND OF OIL, AND SOURCE	1953 February	March	April	May	June	July	August	September	October Estimate	November Estimate	December Estimate	1954 January Estimate	February Estimate
Socony-Vacuum Oil Co., Total	**88,071**	**110,640**	**112,173**	**91,494**	**98,905**	**105,056**	**91,056**	**97,940**	**103,161**	**90,000**	**100,646**	**96,935**	**101,571**
Crude Oil, Total	80,753	103,760	105,271	85,018	90,957	95,934	87,611	88,170	95,096	81,667	92,581	88,032	91,714
Venezuela, Total	24,839	27,233	23,880	30,550	26,058	35,960	27,851	35,704	*36,096	*29,667	*28,581	*32,032	*29,714
34-35° by Socony	24,839	27,233	23,880	30,550	22,099	32,048	27,851	31,702	*28,419	*29,667	*28,581	*32,032	*29,714
34-35° by General Pet.					3,959	3,912			7,677				
40-41° by General Pet.								4,002					
Colombia, Total	21,074	22,564	24,440	23,690	23,941	26,937	19,321	20,073	*23,000	*20,000	*24,000	*22,000	*24,000
20-21°		3,516		3,953		3,626			*3,000		*4,000		*4,000
32-33°	21,074	19,048	24,440	19,737	23,941	23,311	19,321	20,073	*20,000	*20,000	*20,000	*22,000	*20,000
Iraq, 35-36°	6,619	10,924	11,849										
Saudi Arabia, 35-36°			3,912	3,684	12,975	4,371			*4000,		*4,000		
Kuwait, 31-33°	28,221	34,684	32,807	27,094	24,114	28,666	36,732	32,393	*32,000	*32,000	*32,000	*34,000	*34,000
Qatar, 40-41° by Gen. Pet. Co.		8,355	8,383		3,869		3,707				*4,000		*4,000
Products: Fuel, Diesel	(7,318)	6,880	6,902	(6,476)	(7,948)	(9,122)	(3,445)	(9,770)	(8,065)	(8,333)	(8,065)	(8,903)	(9,857)
Standard Oil Co. of Calif., Crude Oil	**89,797**	**111,217**	**123,345**	**115,033**	**124,533**	**97,416**	**114,801**	**130,430**	**102,900**	**102,900**	**102,900**	**102,900**	**102,900**
Saudi Arabia, 35°	47,777	66,275	72,981	62,795	71,550	44,093	67,644	58,617	54,800	54,800	54,800	54,800	54,800
Sumatra, 35°	15,911	24,485	36,097	32,636	31,383	33,719	26,541	33,684	28,700	28,700	28,700	28,700	28,700
Venezuela, Total	26,109	20,457	14,267	19,602	21,600	19,604	16,733	32,227	18,200	18,200	18,200	18,200	18,200
16-54°	16,814	11,917	8,270		8,693	6,522	4,197	8,214	1,000	1,000	1,000	1,000	1,000
Asphalt Crude	9,295	8,540	5,997	19,602	12,907	13,082	12,536	24,013	17,200	17,200	17,200	17,200	17,200
Qatar, 39°							3,883	5,902	1,200	1,200	1,200	1,200	1,200
Standard Oil Co. (Ind.) Total	**53,700**	**33,400**	**37,950**	**49,543**	**33,110**	**32,160**	**21,660**	**33,000**	**34,000**	**46,700**	**46,100**	**43,000**	**43,000**
Asphalt Crude, Venez., 10-17°	10,700	9,300	6,950	15,470	9,810	16,750	18,740	19,910	10,000	10,000	8,900	10,000	10,000
Residual Fuel Oil, from suppliers who can supply foreign or domestic oil	43,000	24,100	31,000	34,073	23,300	15,410	2,920	13,090	24,000	36,700	36,100	33,000	33,000
Standard Oil Co. (N.J.) Total	**229,000**	**263,000**	**226,000**	**247,000**	**181,000**	**188,000**	**187,000**	**221,000**	**252,000**	**252,000**	**252,000**	**283,000**	**283,000**
Crude Oil, Total	103,000	91,000	77,000	85,000	83,000	76,000	94,000	88,000	79,000	79,000	79,000	81,000	81,000
Colombia, under 25°		20,900	19,000	25,000	24,000	14,000	20,000	19,000	23,000	23,000	23,000	17,000	17,000
Venezuela, Total		70,100	58,000	60,000	59,000	62,000	74,000	69,000	56,000	56,000	56,000	64,000	64,000
Under 25°		23,300	31,000		27,000	30,000	35,000	36,000	17,000	17,000	17,000	14,000	14,000
Over 25°		46,800	27,000		32,000	26,000	39,000	33,000	39,000	39,000	39,000	50,000	50,000
Residual, Caribbean, Total	126,000	172,000	149,000	162,000	98,000	112,000	93,000	133,000	173,000	173,000	173,000	202,000	202,000
Venezuela, Total		32,000	18,000		18,000			5,000	20,000	20,000	20,000	20,000	20,000
Under 25°		15,000	12,000		11,000			2,000	17,000	17,000	17,000	17,000	17,000
Over 25°		3,000	3,000					(1,000)					
—25° Bonded		(14,000)	(3,000)		(7,000)			(2,000)	(3,000)	(3,000)	(3,000)	(3,000)	(3,000)
Neth., Ant., Total		140,000	131,000		80,000	112,000	93,000	128,000	153,000	153,000	153,000	182,000	182,000
Under 25°		99,000	82,000		38,000	61,000	42,000	78,000	106,000	106,000	106,000	133,000	133,000
—25° Bonded		(40,000)	(49,000)		(38,000)	(51,000)	(50,000)	(50,000)	(46,000)	(46,000)	(46,000)	(48,000)	(48,000)
+25° Bonded		(1,000)			(4,000)		(1,000)		(1,000)	(1,000)	(1,000)	(1,000)	(1,000)
Sun Oil Co., Crude, Venezuela	**15,189**	**4,025**	**7,678**	**15,187**	**9,002**	**11,373**	**7,313**	**18,778**	**17,903**	**16,000**	**7,258**	**14,193**	**8,036**
26°				4,065	4,286	3,587		3,756	3,710				
30-32°	4,055		7,678	7,042		3,789			6,935	4,333		6,935	
32.4-35°	6,668						3,520						
35-36°								11,173	3,548	3,667	3,548	3,548	3,929
40-43.5°	4,466	4,025		4,080	4,716	3,997	3,793	3,849	3,710	8,000	3,710	3,710	4,107
The Texas Co., Total	**68,777**	**90,498**	**67,727**	**92,336**	**78,779**	**70,227**	**71,691**	**67,089**	**63,599**	**89,039**	**81,193**	**82,677**	**87,464**
Crude Oil, Total	50,637	77,634	60,704	92,336	75,243	70,227	71,691	63,634	57,147	79,039	71,516	73,000	76,750
Venezuela, Total	10,747	21,997	11,001	25,528	15,665	24,960	30,072	22,348	14,415	22,500	29,516	21,452	28,393
29-31.5°	7,508	21,997	11,001	22,073	15,665	21,598	26,781	19,139	14,415	22,500	26,129	21,452	24,643
16°	3,239			3,455		3,362	3,291	3,209			3,387		3,750
Colombia, 32°										8,000		3,871	
Saudi Arabia, 35°	35,023	45,468	41,280	49,066	47,704	28,123	41,619	30,562	33,958	36,000	30,871	37,677	38,357
Sumatra, 35.5°	4,867	10,169	8,423	17,742	11,874	17,144		10,724	8,774	12,539	11,129	10,000	10,000
Residual, Caribbean	18,140	12,864	7,023		3,536			3,455	6,452	10,000	9,677	9,677	10,714
Total Above Companies, All Oils	**962,893**	**1,055,467**	**939,637**	**1,004,768**	**939,002**	**862,358**	**831,903**	**949,004**	**1,015,255**	**1,042,306**	**1,062,282**	**1,099,572**	**1,090,413**
Crude Oil, Total	564,342	677,351	607,311	682,612	681,685	623,368	644,926	666,047	625,280	626,407	628,856	629,440	633,771
Western Hemisphere	378,724	382,556	326,579	429,695	370,216	361,968	407,817	407,050	376,848	382,168	374,156	386,063	372,714
Venezuela	341,084	335,853	276,426	372,313	306,315	311,224	358,446	364,177	315,066	323,034	316,712	335,167	320,843
Colombia	21,074	43,464	43,440	48,690	47,941	40,937	42,821	39,073	46,800	51,800	47,800	43,671	41,800
Mexico	16,566	3,239	6,713	8,692	15,960	9,807	6,550	3,800	14,982	7,334	9,644	7,225	10,071
Middle East, Total	164,840	260,141	236,212	202,539	268,212	210,537	210,568	214,589	210,958	203,000	214,871	204,677	222,357
Iraq	6,619	10,924	11,849										
Kuwait	75,421	125,184	83,507	68,794	119,714	116,466	86,332	106,693	102,000	96,000	105,000	96,000	109,000
Qatar		8,355	8,383		3,869		7,590	5,902	1,200	1,200	5,200	1,200	5,200
Saudi Arabia	82,800	111,743	118,173	115,545	132,229	76,587	109,263	89,179	92,758	90,800	89,671	92,477	93,157
Middle East Unclassified		3,925	14,300	18,200	12,400	17,484	7,383	12,815	15,000	15,000	15,000	15,000	15,000
Far East (Sumatra)	20,778	34,654	44,520	50,378	43,257	50,863	26,541	44,408	37,474	41,239	39,829	38,700	38,700
Products, Total, Incl. Bonded	398,551	378,116	332,326	322,151	257,317	238,990	186,977	282,957	389,975	415,899	433,426	470,132	456,642
Venezuela-Neth. Ant.	390,551	369,863	324,559	305,851	247,317	226,790	176,177	273,457	377,975	405,899	423,426	460,132	446,642
Mexico	8,000	8,253	7,767	16,300	10,000	12,200	10,800	9,500	12,000	10,000	10,000	10,000	10,000
Less Bonded Fuel Oil	(15,118)	(62,600)	(60,467)	(10,299)	(73,381)	(74,541)	(60,245)	(79,879)	(62,523)	(70,866)	(67,423)	(71,229)	(71,857)
Products, Total, Excl. Bonded	383,433	315,516	271,859	311,852	183,936	164,449	126,732	203,078	327,452	345,033	366,003	398,903	384,785
Total, Above Companies, Crude Oil and Products, Less Bonded	**947,775**	**992,867**	**879,170**	**994,464**	**865,621**	**787,817**	**771,658**	**869,125**	**952,732**	**971,440**	**994,859**	**1,028,343**	**1,018,556**
Western Hemisphere	762,157	698,072	598,438	741,547	554,152	526,417	534,549	610,128	704,300	727,201	740,159	784,966	757,499
Venezuela-Neth. Ant.	716,517	643,116	540,518	667,865	480,251	463,473	474,378	557,755	630,518	658,067	672,715	724,070	695,628
Colombia	21,074	43,464	43,440	48,690	47,941	40,937	42,821	39,073	46,800	51,800	47,800	43,671	41,800
Mexico	24,566	11,492	14,480	24,992	25,960	22,007	17,350	13,300	26,982	17,334	19,644	17,225	20,071
Middle East	164,840	260,141	236,212	202,539	268,212	210,537	210,568	214,589	210,958	203,000	214,871	204,677	222,357
Far East (Sumatra)	20,778	34,654	44,520	50,318	43,257	50,863	26,541	44,408	37,474	41,239	39,829	38,700	38,700
U.S. Total Imports, Bureau of Mines, Aug. and Later Estimated	**1,066,250**	**1,112,129**	**1,003,600**	**1,095,742**	**1,050,167**	**949,581**	**†926,000**	**†1,015,000**	**1,130,435**	**1,130,435**	**1,130,435**		
Crude Oil	585,714	655,484	627,967	703,161	706,900	629,452	†673,000	†672,000	673,913	673,913	673,913		
Refined Products	480,536	456,645	375,633	392,581	343,267	320,129	†253,000	†343,000	456,522	456,522	456,522		
Excess over Data for Above Companies, or Imports of Other Companies, Total	118,475	119,262	124,430	101,278	184,546	161,764	154,342	145,875	177,703	158,995	135,576		
Crude Oil	21,372	—21,867	20,656	20,549	25,215	6,084	28,074	5,953	48,633	47,506	45,057		
Refined Products	97,103	141,129	103,774	80,729	159,331	155,680	126,268	139,922	129,070	111,489	90,519		

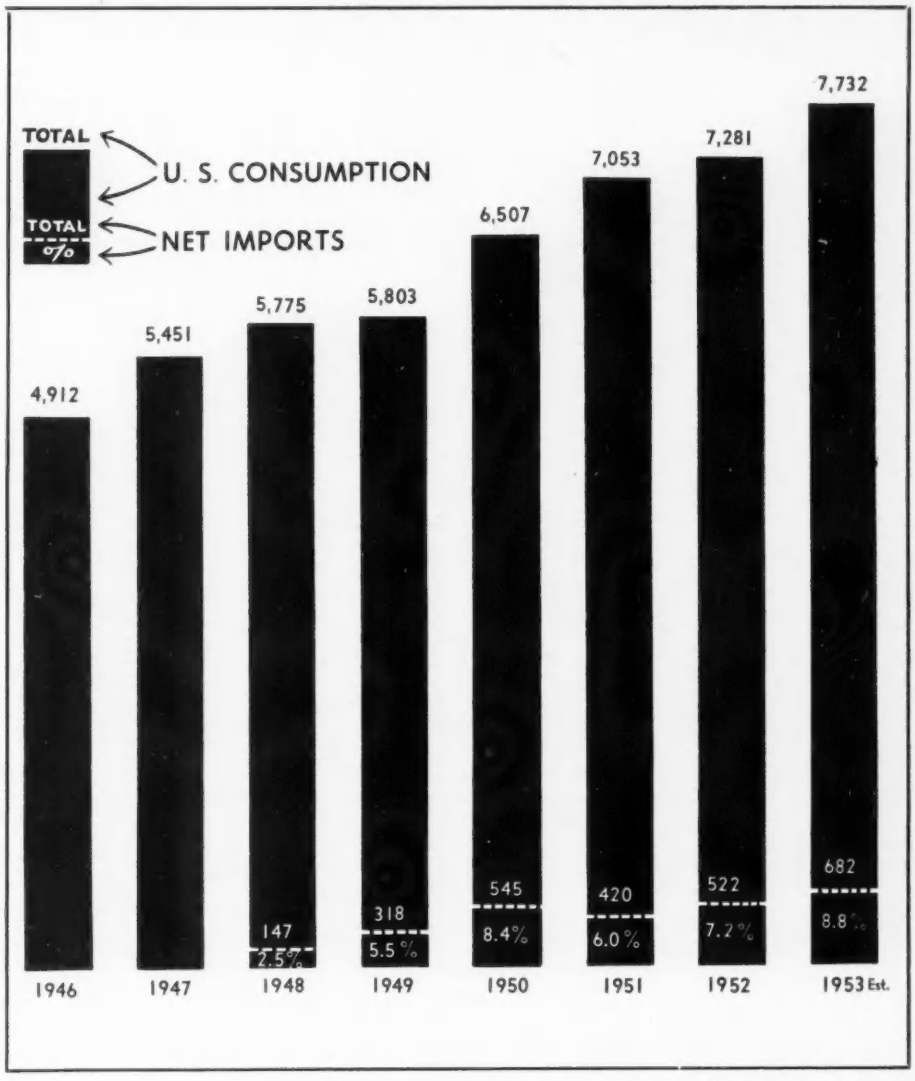
* Company reported total crude only; total here distributed by WORLD OIL roughly in line with earlier trends, to make industry totals by sources possible.
† From American Petroleum Institute.

or 6.1 percent. Sinclair Oil Corporation was eighth largest importer, bringing in 55,977 barrels daily or 5.5 percent of all imports. Standard Oil Company (Indiana) was ninth, importing 33,000 barrels daily or 3.2 percent. Sun Oil Company was No. 10 importer, bringing in 18,778 barrels daily or 1.9 percent.

Eastern States Petroleum Company, independent refiner, Houston, was eleventh, importing 13,300 barrels daily or 1.3 percent of total imports. Cities Service Company was twelfth, bringing in 11,455 barrels a day or 1.1 percent of the total. Phillips Petroleum Company was thirteenth, importing 6,793 barrels daily or 0.7 percent. Unidentified companies imported 145,875 barrels daily in September 1953 or 14.4 percent of total imports.

Also offered here, in addition to the factual data, are suggestions from various sources for dealing with the problem of imports by several means other than government restrictions. These means include:

- Voluntary, cooperative restraints on imports by the importing companies.
- Finding new, voluminous uses of petroleum through intensified research.
- Continuing expansion of the U. S. economy and its utilization of oil.
- Stimulating use of petroleum abroad by promoting greater use of tractors, trucks, automobiles, and other oil-using devices.



Source: U. S. Bureau of Mines

FIGURE 5

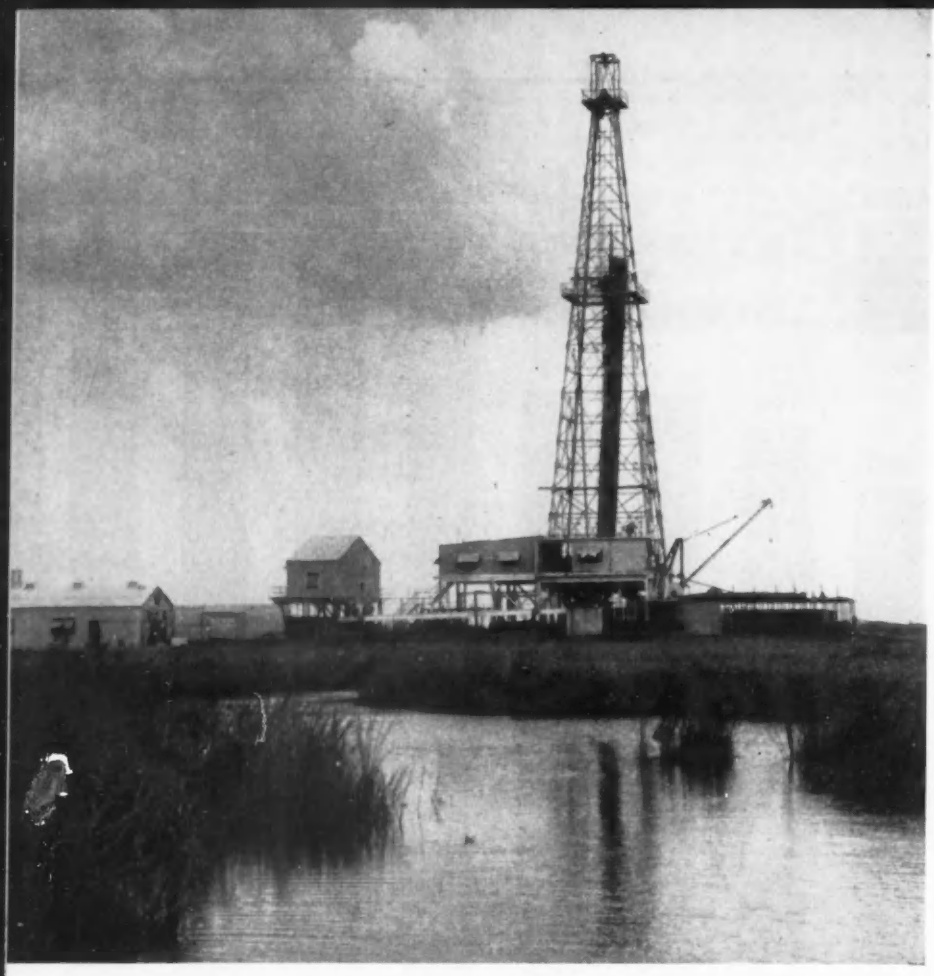
U. S. Domestic Consumption of All Oils and Amounts Supplied by Net Imports (Excess of Imports Over Exports). Thousands of Barrels Daily

Price Question. Oil men are preponderantly free enterprisers and strongly against government controls and restrictions on the economy. When petroleum prices were frozen, they bitterly denounced government interference and declared that freedom of prices was needed to balance supply with demand. Independent operators as well as major company men still are suspicious of government restrictions and would prefer to see the imports question settled without government intervention. Heretofore, at least a semblance of unity between independents and major companies has been achieved in that both groups have endorsed a national petroleum policy of "supplementing but not supplanting" domestic oil with foreign oil.

That policy still is officially in effect and recognized as the ideal to be always sought, although independents assert that it now is being flagrantly violated by the importing companies. They declare that imports now not only supplement but supplant domestic oil. Major company officials deny this. In effect, one West Coast company (Standard Oil Company of California) quite recently affirmed adherence to the national policy by announcing it planned curtailment of imports into California "because past critical shortages have now been met." Companies importing oils to the East Coast repeatedly have stated that their receipts are predominantly heavy fuel oils and heavy crudes which definitely supplement and do not supplant domestic oils, supplying markets that otherwise would be short of the heavy oils involved. On this point there is some supporting evidence, as shown in reports to the Texas Railroad Commission, herewith presented. (Table 4.) Residual fuel oil and heavier crudes constitute important proportions of the total imports.

While there is disagreement as to whether the above official policy is being observed, there remains agreement on the merits of the policy itself. Before resorting to new government control in the form of import restrictions, all groups in the industry might do well to counsel with each other and cooperate toward fulfilling the agreed-upon national oil policy to the satisfaction of all concerned. If honestly subscribing to the policy, each importing company will give preference to domestic oil in securing its required supplies. If in agreement

■ Continued on Page 90



OLD 25—The rig that is never stacked and never moves away.

Why They Don't Get Hurt on Old Rig 25

Where a man who has worked on one rig and in one field for ten years is still a NEW man, you're bound to find safety practiced.

By AL REESE, WORLD OIL Staff

THE QUESTION was this: How did Stanolind Oil & Gas Company's Rig 25, in the Hackberry field of Louisiana, earn The American Petroleum Institute's citation as the safest drilling unit in the U. S.?

Specifically, how did the men of Rig 25 manage to work 525,779 man-hours from October 19, 1945, through and beyond Sept. 30, 1953, in drilling 44 wells with a footage of more than 417,000 without a lost-time accident?

The answer was waiting in the morass a few miles out of Hackberry, down a twist of gravel, over a board stretch, and then a plank walk spanning the black waters and the waving swamp grass to where Fireman Jasper Little lounged in the doorway of the boiler barge, there in the majestic shadow of Rig 25.

Little answered the question, all unknowingly, by cracking one of his own. The talk was of the other crew members and the name of D. P. Desormeaux came up. Desormeaux, a long-time neighbor of Jasper's, has been a derrickman on Rig 25 for ten years.

"Who? Desormeaux?" A sly grin poked at the corner of Jasper's mouth. "Oh, you mean that NEW man!"

There, in words of jest, was the sober explanation of a remarkable safety record. True it is that, like many another operation, Rig 25 adheres to an alert, aggressive safety program. Like others, it is a barge unit, without the attendant hazards of rigging up and tearing down. And, like others, it has the best of equipment. But in some respects Rig 25 is unique:

- Five men on the day tour, plus the toolpusher, have worked on this rig in this field an aggregate of 92 years.
- The toolpusher and seven of the 20 men on the four tours came with the rig when Stanolind acquired it 18 years ago.

Here are the day tour's ages and years of service on this same rig:

C. W. Frankland, 56, toolpusher, 18 years.

T. W. Bonsall, 51, driller, 18 years.

Jasper Little, 57, fireman, 18 years.

Dupre Hebert, 51, floorman, 18 years.

D. P. Desormeaux, 34, derrickman, 10 years.

Dedieau Desormeaux, 53, floorman, 10 years.

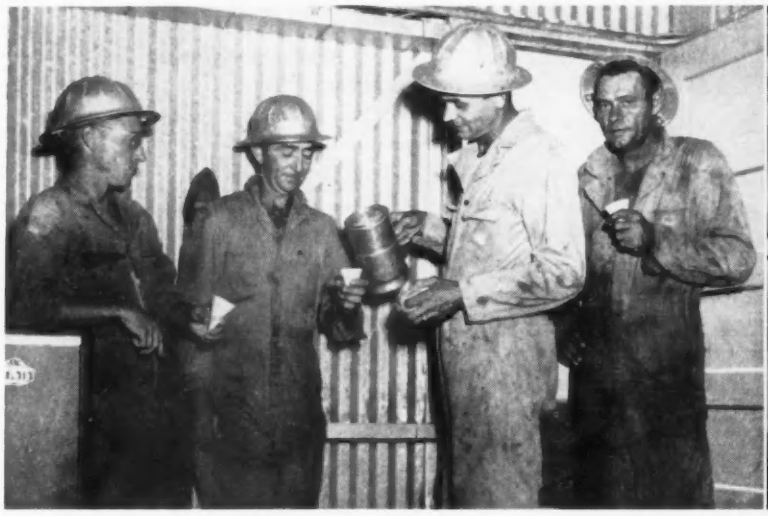
Though little but the name remains of the rig as it was 18 years ago, the modernization has not been so swift as to prevent this crew from knowing every bolt in its spic-and-span entirety. Moreover, they can foretell every move their fellow crewmen will make in any circumstance. And they know every formation by rote down to 10,000 feet.

Field Superintendent R. M. Reeves is only half joking when he tells it like this: "We don't really need a paleontologist around here. Bill Frankland knows the first name of every bug from here to basement."

He also says: "When one of those drillers tells me he's got a sand, I just reach for the phone and ask for a potential."

The practiced efficiency of the day tour's veteran crew sets a standard for the other three, all experienced beyond the usual. Driller Bob Cohen's bunch is typical. Cohen, 38, is another who came with the rig. Ludran Courmier, 36-year-old derrickman,

EXPERIENCE BREEDS SAFETY. Division Safety Supervisor Boyd Cox (front left) with the crew whose aggregate experience on this rig in this field is 92 years. Beyond Cox are C. W. Frankland, T. W. Bonsall, Jasper Little, D. P. Desormeaux, Dedieau Desormeaux and Dupre Hebert. Right is Driller Bob Cohen's young crew, with an average service on Rig 25 of more than ten years. Bottom to top are: Cohen, Ludran Courmier, Edgar Johnson, Carl Johnson and Jack Waldron.



TIME OUT FOR COFFEE . . . and be sure to drop that used cup in the can. Good housekeeping is a must on Rig 25. Left to right are Carl Johnson, Cohen, Waldron, Courmier, and Edgar Johnson.

SAFETY SESSION. Toolpusher Frankland, left, adds another safety message to the bulletin board just off the rig floor. Posters and other visual aids are important to Rig 25's safety program. Right, Frankland conducts a safety meeting. Each crew has one such 30-minute session each week on company time. The safety schedule also calls for one area foremen's meeting each month. Left to right are: Frankland, Ray Duhon, L. R. Biano, J. L. Riley, G. H. Camp, Driller J. T. Johnson, and Cox.

The Big Moment . . .

for FRANK M. PORTER

In some ways, Frank M. Porter's Big Moment has a Horace Greeley twist to it.

A native of Brooklyn, N. Y., and a product of that borough's public school system, he broke away from the bright lights and the concrete pavements of the big city in 1916 to "go West" and try his hand at something new.

Frank Porter

He was 23 then, and an employe of a textile firm. The Big Moment came when a chance letter offered him a job in Ardmore, Okla., in the oil business. To stay in the more comfortable East, or to abandon everything and begin a new career in a new business in a new section of the country—that was the tantalizing problem with which he wrestled. The money was about the same, but the lure of the West was the factor which finally prompted him to pack his bag and head for Oklahoma.

Porter is again a part-time resident of New York City, but his status is far-removed from that of the young clerk who tossed all of his eggs into an oil barrel. He's now president of The American Petroleum Institute and, since 1944, has been president and owner of Fain-Porter Drilling Company, Oklahoma City.

When Frank went to Ardmore, his first job was with Dundee Petroleum Company. Two years later, he became associated with Wirt Franklin, one of the Mid-Continent area's best-known wildcatters. In 1927, when the Wirt Franklin Petroleum Corporation was formed, he was named vice president in charge of oil operations. In 1939, together with the late Leslie Fain of Oklahoma City, he formed the Fain-Porter Drilling Company. He became sole owner in 1944, when Fain passed on.

Porter is equally at home at a spudding operation or in a swivel chair. He served three terms as president of the Kansas-Oklahoma Division of the Mid-Continent Oil & Gas Association, and several more as president of the general Mid-Continent Oil & Gas Association. He was elected president of API in the spring of 1950.

Under his direction, in the opinion of many observers, the Institute has shaken off some of the primness of the past to become a dynamic association of oil men.

Rig 25

has been on the rig 6 years; Jack Waldron, 43, the bogeyman, 13 years; Edgar Johnson, 37, floorman, 10 years; and Carl Johnson, 30, floorman, 7½ years.

Of the others, Driller J. T. Johnson has a crew whose service on Rig 25 averages 6 years; and Driller K. P. Parker's crew has an average experience of 9 years.

Questions aimed at discovering why these members of a traditionally nomadic tribe have struck their roots so deeply into the Hackberry swamps will bring no two similar answers. But fitted together, the replies can be pieced into a mosaic that tells it all.

On the rig, Edgar Johnson said: "It's a good outfit to work for," and Courmier explained: "You've got to work some place. Name me a better one."

On the road back, Boyd Cox, Texas-Louisiana Gulf Coast Division Safety supervisor, added a piece: "That young fellow Carl Johnson is a second generation Stanolind man. He doesn't just work here. He lives here. There's a difference."

In the field office of the Stanolind camp, Bob Reeves contributed: "Most of them have a few cows, maybe some royalty. They fish and they crab. They may have a little garden, but you'll notice they don't go around plowing up a lot of land to worry over. It's a good life."

The mosaic was completed in Ferdy's Place, a buzzing oasis in Hackberry's dusty cluster of small buildings, where many an habi'ue—like Ferdy himself—is an alumni of old 25, the rig that is never stacked and never moves away. From under the hard hats at the bar and around the domino table came enlightenment:

"Eighteen out of those 21 men on Rig 25 own their own homes and maybe a farm, too. How come you think it's funny they don't move?"

"Nobody likes to leave this place. The boys go out and fetch back a wife. The girls wait for a single man to stray in from the outside and—bing!—he's a goner. Take me, for example. I came here to stay a week. That was 25 years ago."

Stanolind's safety efforts are tailored to the particular problems of these particular men. This is made possible through a program of decentralization which permits virtual autonomy in the four domestic divisions.

Division Safety Supervisor Cox's aides in the coastal division are Jimmy Means and Paul Harper. They follow the basic pattern advanced by Safety Supervisor D. A. Klemme at Tulsa, but work out their own program according to their own needs under the direction of Walter E. Forry, industrial relations superintendent at Houston.

Since Cox ended his ten-year stay in the engineering department to enter safety work in 1945, the drilling program has stressed "humanics." Its success is attested by the fact that the coastal division has had only two lost-time accidents on seven rigs from the year's beginning through mid-October. The division's drilling accident experience for all of 1952 was 14.72, compared with the U. S. experience of 23.61, according to the National Safety Council.

At Stanolind, they believe it is the safety man's task to sell, not enforce. Safety enforcement is a part of the line supervisor's job of maintaining efficiency. Thus, to be safe is to be efficient. And as proof, they offer the five young men in their 50's on the day crew of old 25, a rig recognized by the API as the nation's safest and a crew tabbed by Field Superintendent Reeves as "the best in the business." —**The End**

MILES APART IN SIZE AND WEIGHT

Here are two Bethlehem drop forgings that happened to be going through the shops the same day. The small connecting rod weighed only a pound and a half. The big one, a pretty husky specimen, couldn't be cradled in anybody's hands. It weighed more than a hundred times as much as the little fellow.

This contrast isn't unusual, for Bethlehem makes drop forgings ranging in weight from a few ounces up to 250 lb. Through the years we've produced literally millions of them—gear blanks, connecting rods, hooks, wrenches, links, rings, crankshafts, tool parts—and so many other designs it's hard to estimate the number. These forgings have gone into scores of industrial fields, including petroleum, mining, aviation, power, and transportation.

Today we're better fixed than ever to fill your needs in closed-die forgings. Ours is a fully-integrated operation—everything from making the steel to cleaning and shipping the finished forgings. Call us the next time you're in the market! We'll welcome the chance to work with you and your staff.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

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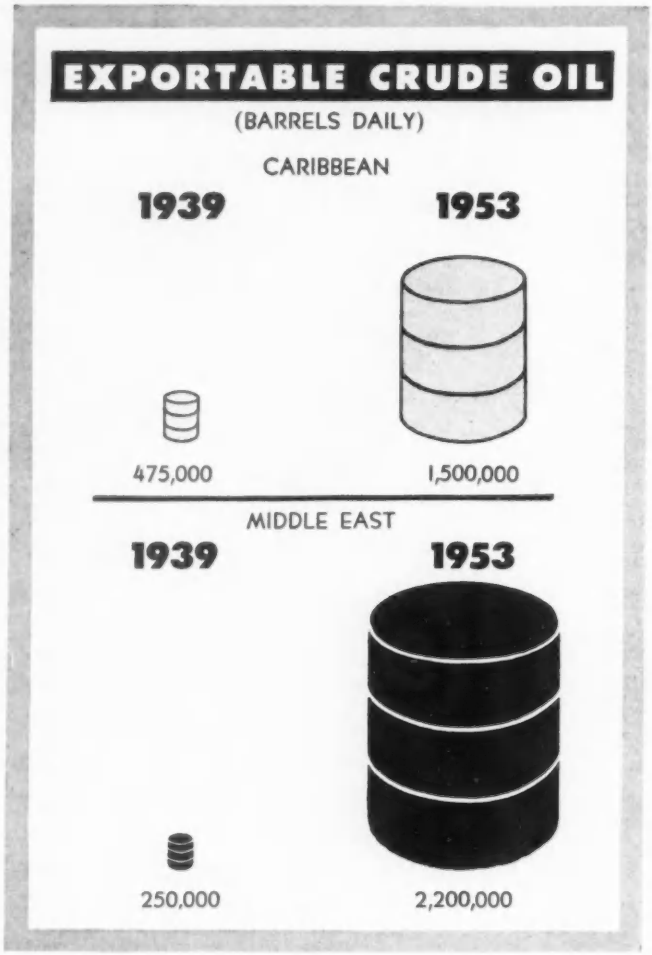
BETHLEHEM STEEL

BETHLEHEM DROP FORGINGS



SINCE 1950 the Middle East has been the leading exporter of oil in international petroleum trade, having replaced the Caribbean area. Development operations in most Middle East producing countries were at a standstill during the war, and the region's growth has been accomplished since the war.

Watch the Middle East

Developments in this prolific crude-producing area could have a major impact on industry economics.

By ROBERT E. SPANN, WORLD OIL Staff

DEVELOPMENTS IN the Middle East will bear close watching in the near future. They could have a significant impact on petroleum's basic economics: Supply and pricing.

Middle East petroleum now reaches every continent. Current rate of production in the area is 2.5 million barrels daily, equivalent to about 20 percent of the world's total. In some areas, particularly European nations, Middle East oil has captured almost the entire market that before World War II had been supplied from other sources; in other areas, Middle East oil is a small, but steadily increasing part of the total petroleum supply.

Over-all, petroleum from the producing nations surrounding the Persian Gulf constitutes the largest share of the total entering international trade. The exportable crude surplus from the Middle East now amounts to about 2.2 million barrels daily (see chart). It has grown at such a rate in recent years as to have forced the Caribbean area, once the leading supplier in international trade, into second place.

The combined Middle East oil output from Saudi Arabia, Kuwait, Iraq, Qatar, Bahrain, Iran, and Turkey is equal to 39 percent of present U. S. crude production. The area has its petroleum industry closely tied to the political rulers in each land, since the latter share 50 percent in the profits. But as was seen with the Iranian "nationalization" in 1951, the concessionaire company is a limited partner in the so-called 50-50 operation. Continuation of the partnership is subject to the pleasure of each government in the Middle East.

With such a position of importance in the world oil industry, the trend of developments—political and economic—in the area are of importance to the entire petroleum industry, the small independent producer in the U. S. as well as the large international oil companies. Of the current trends in the Middle East, the most significant are:

- The future of Iranian oil.
- Recent establishment of Middle East posted prices.
- The dispute over "dual" pricing in the Middle East.

Of these, the possible resumption of petroleum operations in Iran would have the most immediate and most noticeable impact on oil producers everywhere. It is also the most unpredictable. Even under the most ideal conditions that could result from any eventual settlement bringing Iranian oil back into world markets in any substantial volume, there will be an oversupply—possibly a serious one—of petroleum. Many plans have been drawn to "make room" for Iranian oil and for the actual marketing of production.

For the most part, these are the ideas of the planners in the U. S. State Department, which are similar to proposals previously rejected by the deposed Iranian government of Premier Mossadegh. A realistic plan for the Iranian oil industry, once it settles the claims of Anglo-Iranian Oil Company, however, will be urgently needed.

In discussing detailed economics of the Iranian oil problem, WORLD OIL

WHY W. C. NORRIS CHOSE 8627 for it's *NEW* SUCKER ROD TYPE 35

EDW. C. BOLGER, President

"In developing the Type 35 Sucker Rod, our engineering staff and field men talked with engineers, oil company superintendents, and others engaged in the production of oil, to determine the grade rod that would best fill their needs," according to Ed Bolger, President, W. C. Norris Manufacturer, Inc.

"The answer lay in an economically priced rod that would more greatly resist fatigue which has its start in corrosion. Metallurgical research in heat treatment to obtain a crystalline structure to resist fatigue resulted in our selection of a modified SAE 8627 alloy steel. This nickel, chromium, molybdenum alloy has corrosion resistant properties and lends itself to heat treatment that produces a grain structure of such a nature that fatigue life is greatly enhanced."

"In the Type 35, we believe we have attained the twin goal of a rod that will have both corrosion resistance and a longer fatigue endurance life."

The W. C. Norris plant — Tooled for expert production — Teamed with long experience — produces a sucker rod of the highest quality. Time and temperature of forging operation that will produce proper material flow is carefully controlled. Time and temperature in heat treatment that will produce a uniform grain structure from end to end is accurately measured.

W. C. Norris Sucker Rods are also furnished in Type 30 and Type 40 for your pumping needs.

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The Middle East may now be in a position to set world petroleum prices

in its October issue called attention to the only practicable method of returning Iranian oil to its former markets, through the cooperative efforts of the major international oil companies. It remains to be seen how soon the Iranian Government will be in a political position to give serious thought to entering negotiations with Anglo-Iranian for settlement of the compensation issue and, once a settlement is reached, to listen to a workable plan to resume production.

The present government in Iran has moved cautiously; it could well be that a resumption of negotiations over terms of compensation could mean an end to the regime of General Zahedi.

Any expedient plan to operate the Iranian industry on a temporary basis that may be proposed by State Department officials pending a settlement of the compensation question could have serious repercussions. Any proposal that would ignore the basic legal question of outright abrogation, even temporarily, would undoubtedly subject all oil companies operating around the world to new pressures for higher royalties by governments owning subsurface mineral deposits.

The implications arising from Middle East petroleum pricing may be of a longer range nature than the Iranian oil problem, but are of no less importance. Stated briefly, the Middle East may now be in the position to set future world prices for petroleum.

Historically, crude petroleum prices around the world have been established directly from the economic forces applicable to the industry in the U. S., the largest consumer and once a major exporter of oil. Prices around the world were based on U. S. Gulf Coast quotas, with certain differentials as to transportation and quality. With the U. S. now a net importer and hardly a factor in the export markets, Gulf Coast prices have lost their significance in world trade.

Three years ago one seller of Middle East crude initiated general price postings, but it was not until early in 1953 all sellers then made public price postings. Inferences from this latter action are many. Prices at which the owners of Middle East oil would sell crude to outsiders were made public for the first time.

There are no economic reasons why Middle East oil prices should be pegged to those in the U. S. Costs of production in the Persian Gulf are only a fraction of those in the U. S.; the type of demand is decidedly different; market methods vary considerably; logistics of supply are not similar.

Present postings in the Middle East date from the spring of 1948, when the start of Marshall Plan oil sales, partly financed by the U. S. Government, necessitated the creation of a Persian Gulf price. These prices, like the previously existing individual buyer and seller prices in the Middle East, were based on a formula which took the U. S. Gulf Coast quotas and made allowances for tanker differentials between the U. S. Gulf and Europe and from Europe to the Persian Gulf and Eastern Mediterranean.

With an entirely different set of economic factors and highly competitive markets, there remains little, if any, relation between the selling price of Middle East crude, U. S. crude and Caribbean area crude. Because of lower production costs, Middle East prices in the present period of ample petroleum supply have a greater margin of possible reduction, limited primarily by the extent that reductions would bring possible economic injury to production owned by Middle East producers in the U. S., Venezuela or other high-cost areas.

Continued growth of Middle East oil production, however, tends to minimize such possible injury of competitive prices and gives greater emphasis to the economic importance of Middle East oil to each company producing it. Net income to American companies from their foreign operations, for example, last year increased by 15 percent, while net income from domestic operations of these companies showed a 10 percent decline, according to the "Financial Analysis of 30 Oil Companies," published by Frederick G. Coqueron of The Chase National Bank of the City of New York.

Prices posted for Middle East oil are the subject of renewed negotiations between Arabian American Oil Company and the Saudi Arabian Government, and could have important bearing on the pricing methods in other Middle East countries. Prior to the public price posting, when Arabian oil was being produced and sold in smaller volume than at present, Aramco entered into an agreement with the Saudi Government concerning the price the producing company was to receive from its four owners—Socony-Vacuum Oil Company, Standard Oil Company of California, Standard Oil Company (N. J.) and The Texas Company—for intercompany sales of crude. This intercompany price was set at $1.43 a barrel. With the rise of posted prices the four owning companies first posted a price of $1.75 a barrel and more recently $1.97 for 36 gravity crude f.o.b. Ras Tanura, Saudi Arabia, for sales to outside buyers.

While the original inter-company $1.43 a barrel price under long-term contracts was suitable to the Saudi Arabian Government originally the upward movement of posted prices at which the owners sell the oil has been the subject of discussion off and on over the past two years. Since all of the crude produced by Aramco is sold for $1.43 a barrel to the owners, it is this figure that the Saudi Arabian 50 percent share in profits is based. The government argues that it should receive 50 percent of the posted price of $1.97, and is demanding that payment be made by Aramco retroactive for about five years to cover one-half of the difference between $1.43 a barrel and $1.97 a barrel.

Negotiations between Aramco and the Saudi Government were recently resumed on this dispute, and should the demands of the government be met, producers in other Middle East countries fear the way would be open for each Middle East nation to make demands for additional payments.

The relationships in other Middle East nations on the price question are not similar to that in Saudi Arabia, but each nation, to save face, wants the same financial benefits that all other Middle East nations receive.

—The End.

What Are Russia's Tidelands Worth?

The Soviets say the submerged lands in the Old Baku region are growing in importance as the Caspian Sea level continues to sink.

CRUDE PRODUCTION in the Ural-Volga region amounted to 40 percent of total Russian output for the year, according to a report by Soviet Minister of Oil Industry Baibakov which appeared in the Communist Party newspaper Pravda. Russia's 1952 oil yield has been estimated at 311,400,000 barrels, 9.26 percent more than 1951 production and 6.95 precent of the total world yield for the year.

Apparently Baibakov included in his reference production from the so-called "Second Baku" and the Emba oil fields, situated south of "Second Baku" near the northern shore of the Caspian Sea.

Emba fields have been in production since 1911. While field production statistics are not available for recent years, reserves were put at 500 million barrels by "Soviet Oil Reserves," a summary published by Fedorov and Shumilin in 1935.

Boom Reported. Latest reports from Soviet newspapers continue claiming that a boom is under way in the Old Baku area, although the same sources admit that drilling plans are not being fulfilled and that completions are lagging.

Claimed, however, is a rise in production, particularly from the tide water area. This production, say newspaper accounts, was 25 percent more during the first nine months of 1952 than in the corresponding period of the previous year.

Soviet sources point to intensified oil activity in the Caspian Sea, centering about six or seven miles from the shore line around the islands of Artem, Jiloy and Nefte-Kamni.

While Artem island has been producing oil for more than two decades, its initial potentialities did not appear promising. Now, Russian technical journals say, "very good" production is being obtained from a deeper horizon, at 8000 feet, which is probably the Podkirmakian zone.

Nefte-Kamni island contains oil-saturated rocks and mud volcanos emerging from the surface of the sea which is shallow in this vicinity. A pile- and rock-supported platform has been erected at the island to accommodate drilling rigs and living quarters.

Sea Level Sinking. Russians say potentialities of production from submerged lands are growing in importance in the Old Baku region, with the Caspian Sea presenting the greatest inland salt water basin in the world. The total area approximates that of France. Level of the sea is about 90 feet below ocean level. Of importance to the oil industry is that the Caspian level began sinking at an accelerated pace during the past ten years.

This water loss is caused by evaporation. Previously the loss was compensated for by the Volga, Ural, Kuma, and other rivers. But now the largest supplier—the Volga—has decreased its influx because large amounts of its water are diverted to irrigation and other purposes.

It is estimated that because of such loss and resulting lowered water level, the northern area bordering on the Caspian has gained 8000 square miles. Some of this land reclaimed by nature in the vicinity of Apsheron (Baku) peninsula has proved to be oilbearing, i.e., the Busovna oil fields where, according to Soviet sources, "hundreds of oil wells yielding thousands of barrels of oil" are situated.

Federal Government Urged to Quit Hoarding Public Lands

The U. S. government's hoarding of public lands has come under increasing criticism, and it is being widely urged that in the best interests of all concerned, the federal government should sell most of those lands to private citizens. They, in turn, would put it to productive use and pay taxes upon it to the states in which it lies.

The federal government owns 24 percent of the total area of the U. S., including over 50 percent of the land in six states. These lands are largely withheld from productive use, and they provide no revenue to the states in which they are located.

This is a question of great importance to all the people, and it is particularly important to the petroleum industry, since oil operators generally have found it more satisfactory to deal with private owners and state governments than with the federal government in leasing lands for petroleum exploration and development.

An informative and interesting discussion of the public lands was made before the American Bar Association at Boston recently by Rex G. Baker, general counsel of Humble Oil & Refining Company, Houston.

A Senate committee has recommended that the transfer of land in fee to private ownership should be the main objective of our public land policy, Baker pointed out. He declared that Congress should not only accept this recommendation but also should undertake a review of the entire present federal ownership of land, with a view of ascertaining the portion of such lands needed for legitimate government activities as distinguished from federal uses based upon bureaucratic or socialistic practices or theories, and should facilitate the disposition of all other federal lands into private hands.

Definite benefits would result from sale by the federal government to private individuals of most of the remaining public domain, asserted Baker. The lands would be placed in private hands for productive use and the establishment of homes for American families, he said. The sale of the lands to private individuals would afford a fruitful source of revenue to the several states, and at the same time would relieve the federal government of vast expenditures in the administration of its public lands.

Instead of being a benefit to "all the people," said Baker, the vast public domain is financially a burden to them, and he cited figures on the heavy costs to the taxpayers. Sale of the public lands to private owners would materially strengthen the economies of the several states and the country as a whole, he stated.

Private ownership of lands and resources has been the basis for the outstanding industrial and productive growth so far achieved by the country, said Baker, and a return to such a policy is necessary to assure the continuance of that growth. "Hoarding of one fourth of the surface area of the U. S. by the federal government is a luxury which our people cannot afford," he said.

Who Really Pays Corporation Taxes?

A recent study by the National Association of Manufacturers shows that taxes levied against corporations ultimately are paid by individuals and are particularly burdensome on low-income families.

NAM economists computed the federal government's corporation tax levies cost a typical urban family of four persons approximately $167 a year, depending on the income level. Taxes on corporate earnings are particularly heavy on families in the $2500 to $3000 income range.

The NAM, in its study of the burden resulting from different types of taxes on low and medium income families, emphasized that all taxes, irrespective of their nature or from whom they are finally collected, are paid by the people as part of the price of articles or in some other way.

Taxes on corporation income are paid in part by stockholders in the form of lower dividends and by consumers in the form of higher prices for products. For the purpose of the study the NAM's researchers assumed that taxes on the normal earnings of corporations bear equally on stockholders and consumers and that taxes on so-called "excess" profits are borne entirely by the stockholders.

Based on this assumption the NAM found that a typical family of four with an income of approximately $4000 a year indirectly pays $234 a year as its share of taxes levied on corporation earnings. This is only a little less than the $271 which this same family pays in individual income taxes and represents nearly a fourth of the group's total tax bill of $1093 for taxes of all kinds—federal, state and local.

For families with both higher and lower incomes the economists estimated the burden resulting from federal corporation income and "excess" profits taxes on families in other income groups were as follows: $2500 a year, $167 in taxes; $3000 a year, $190; $5000 a year, $388; $7500 a year, $731; $10,000 a year, $1135.

The study points out that the lesson to be drawn from its figures is not that corporations should be exempted from paying their fair share of taxes, but that no matter who the taxes are collected from, they are paid by individuals, persons with modest income as well as those whose higher income is subject to higher taxes. That every dollar the government spends must come out of someone's bank account or paycheck and that while taxing corporations may appear to be a "painless" way of paying government costs, actually such taxes ultimately fall on individuals and hurt those in the lower income brackets the most.

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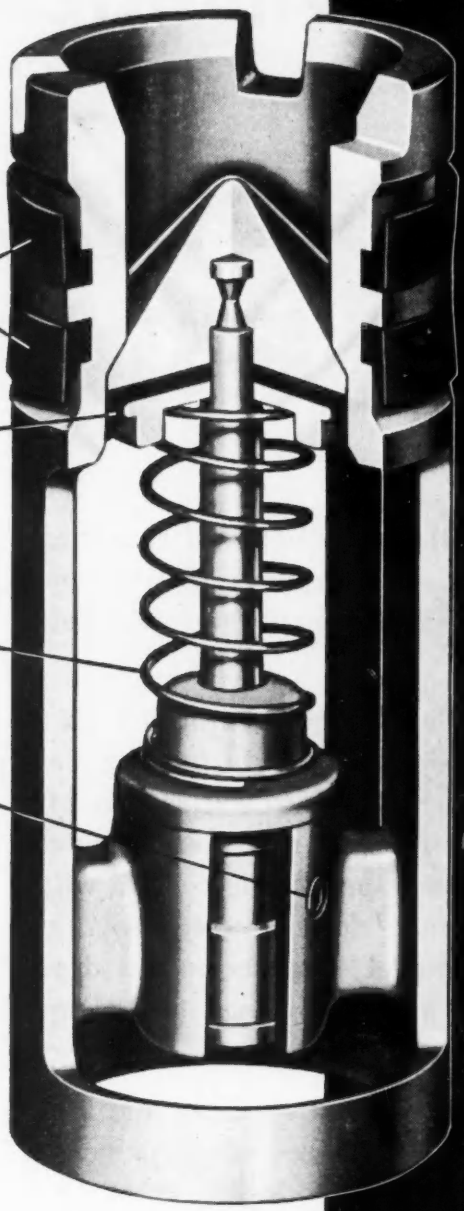

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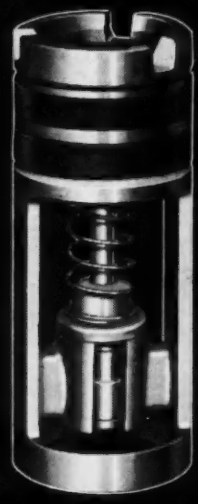

Baker Model "F" Drill Pipe Float Valve, Product No. 4813

Suggestions of drilling contractor and drilling department personnel have helped in redesigning and improving Baker Drill Pipe Floats so that they are *now better than ever*. They will save *you* time and money, muss and fuss, in every string.

POSITIONED WHERE DESIRED—A majority of operators install the Baker Drill Pipe Float Valve in a recess in the lower end of the drill collar where it is held in position by the pin on the drilling bit. Or the Valve can be positioned in a Drill Pipe Float BODY which serves as a tool joint sub at any point in the string.

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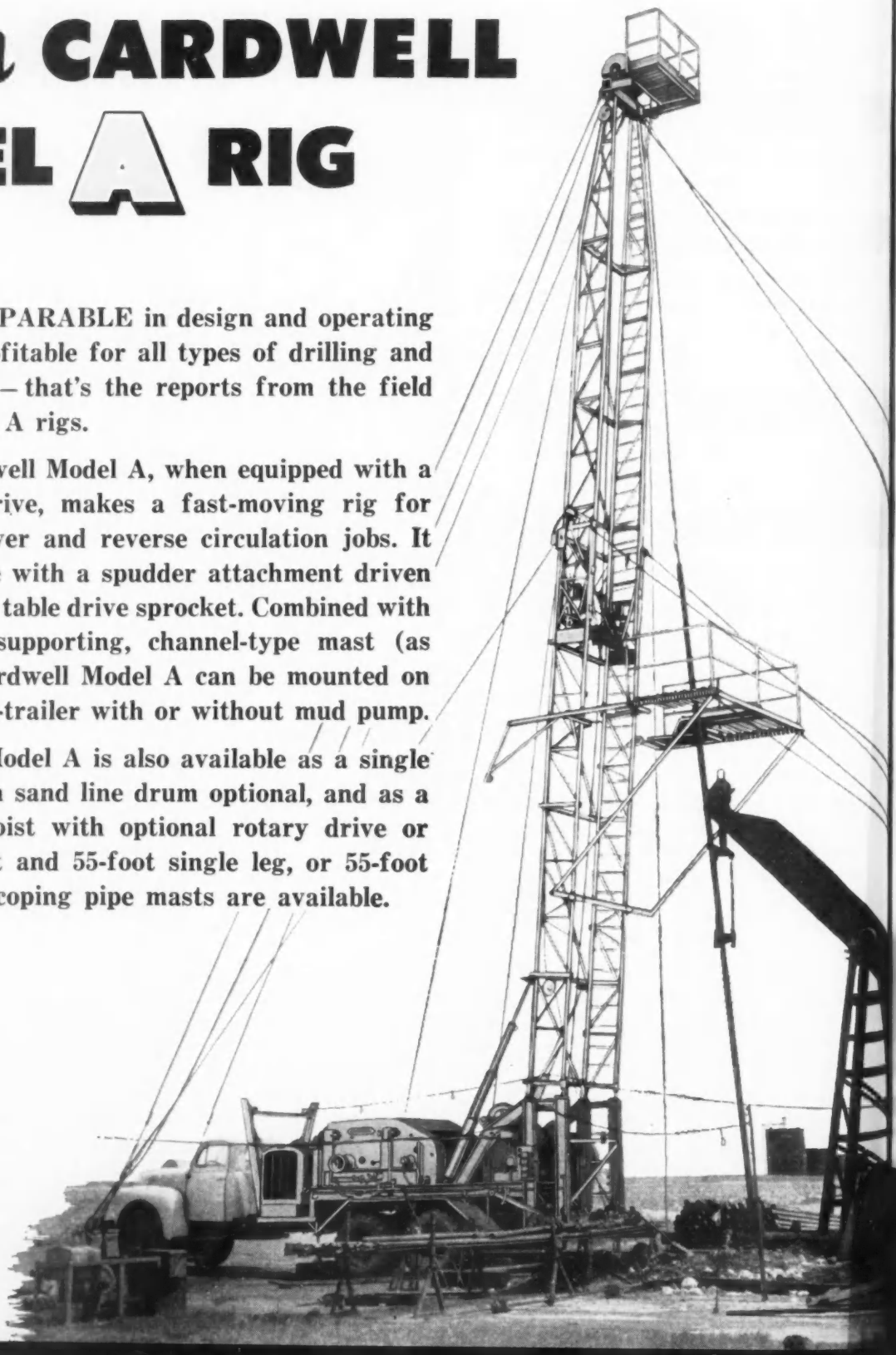
INCOMPARABLE in design and operating efficiency...profitable for all types of drilling and servicing work – that's the reports from the field on these Model A rigs.

This new Cardwell Model A, when equipped with a rotary table drive, makes a fast-moving rig for drilling, workover and reverse circulation jobs. It is also available with a spudder attachment driven from the rotary table drive sprocket. Combined with a 65-foot, self-supporting, channel-type mast (as shown), the Cardwell Model A can be mounted on a truck or semi-trailer with or without mud pump.

The Cardwell Model A is also available as a single drum hoist with sand line drum optional, and as a double drum hoist with optional rotary drive or spudder. 48-foot and 55-foot single leg, or 55-foot double leg telescoping pipe masts are available.



65-foot telescoping, high-tensile steel, four-leg mast has a capacity of 75,000 lbs., yet maintains a low roading height. Rotary table folding base is available.

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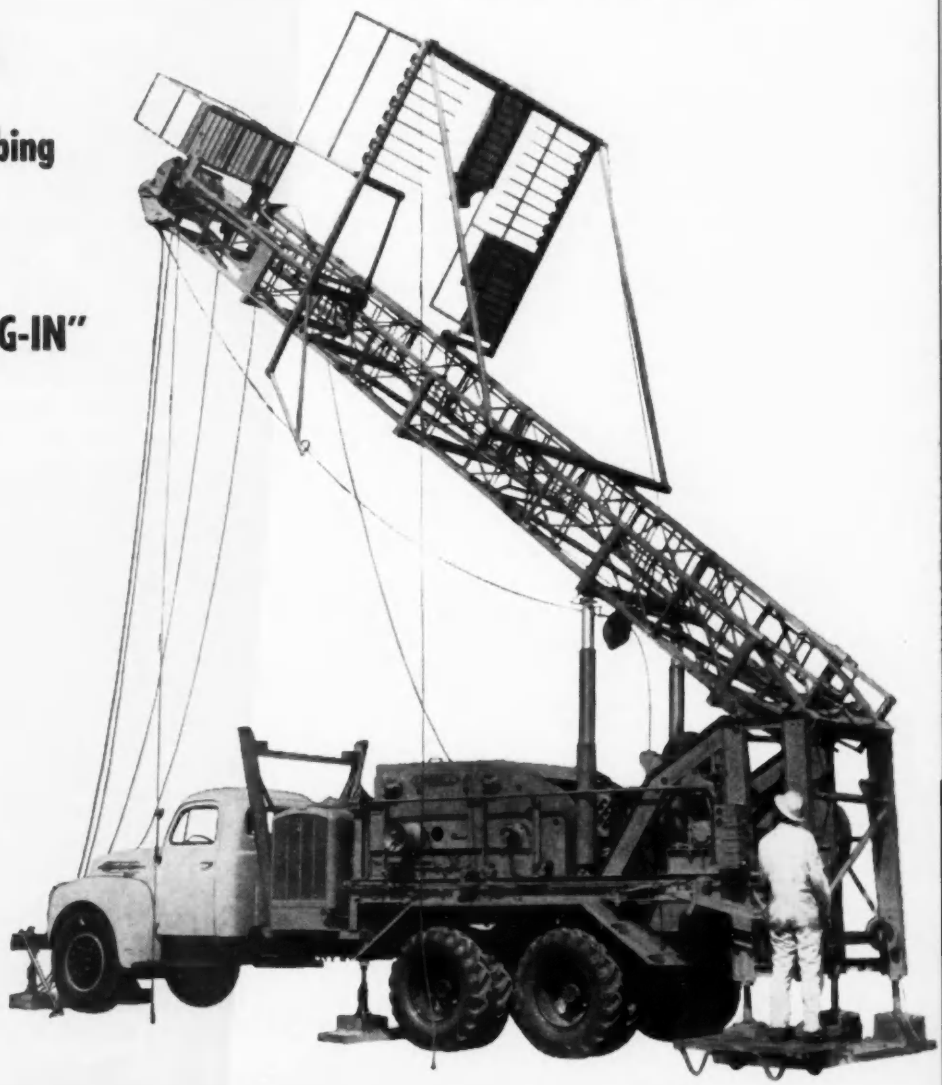
■ **ROTARY WORKOVER**
to 5,000 feet with tubing

■ **CABLE TOOL "DRILLING-IN"**
to 3,700 feet

■ **RODS AND TUBING**
to 5,000 feet

65-foot, self-supporting mast is carried on the truck or trailer mast supports, and can be raised and telescoped to full height in a few minutes.

ALL drives, including main drum, sand line drum and rotary table operate through Cardwell "Flex-Disc" air friction clutches. Engagement of these clutches is provided by air controls mounted in a panel at driller's position. Controls for either truck or skid level mounting are available. Torque converters can be used on all models instead of the standard five-speed gear transmission. The Cardwell "Hi-Lo" drum drive, consisting of two "Flex-Disc" air friction clutches, provides two speeds to the drum and rotary from torque converter output.



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By **RAY L. DUDLEY,** Publisher, and **WARREN L. BAKER,** Editor

Economic Position Improves

SIGNS OF IMPROVEMENT in petroleum's burdensome stock position give hope that the industry will avoid serious market trouble this winter. Consequently, cautious optimism is replacing the pessimistic feeling of a month ago.

Sharp cutbacks in U. S. crude oil production and refinery runs caused improvement in over-all inventory levels the past month. However, the industry is not yet out of the woods. It must continue to operate at reduced rates for some time before oversupply conditions are brought into proper balance with demand. The outlook is made promising by assurance that crude production in November will be even smaller than in October. Further improvements will occur in the coming month if refiners continue to hold runs to stills to late September and early October levels.

•

EXTREMELY HELPFUL is the drastic reduction in U. S. crude oil producing rates. Production in early October was averaging a little over 6,300,000 barrels per day, down 265,000 barrels from the August average and 170,000 barrels per day below the average for September.

Additional curtailment of production in November has been assured by the action of the Texas Railroad Commission, which has set an allowable 140,000 barrels per day under October's permissible output. This holds definite promise of further improvement in the industry's economic picture.

Improvement in the industry's inventory picture has been due entirely to the cutback in domestic crude production and refinery runs. Imports have been setting new records. Total imports in the early part of October reached a new high of 1,261,000 barrels daily, of which 1,135,000 barrels daily were imported to the area east of California.

Refinery crude runs during the first two weeks of October averaged 6,900,000 barrels daily, down 225,000 barrels from the August level and about 140,000 barrels per day below September's daily average.

Continuation of these refining levels, coupled with lower crude production, would go far toward preventing the accumulation of excessive inventory during the coming five months.

SOME IMPROVEMENT took place the past month in gasoline inventories, although they continue excessive. Gasoline stocks in mid-October were only 1 million barrels less than in mid-July, when normally they would be something like 10 million less. However, there was some improvement the past month.

Motor fuel inventories on October 17 totaled 142¾ million barrels. This was 20¾ million barrels above a year ago. However, they had been 26 million barrels above a year ago levels in mid-September. Recent reductions in runs to refineries have not had full influence on motor fuel inventories since yields of gasoline have been maintained at around 50 percent.

Gasoline yields must be reduced during the next several months to prevent the accumulation of excessive inventories during the coming winter off-season months. If demand approximates several forecasts, much of the danger in the gasoline stock situation can be avoided through downward adjustment of yields. Otherwise, gasoline inventories of 175 million or more will be accumulated by the end of March. Any amount over this figure would be indeed burdensome.

Greater movement of heating oils has been effective in lowering the inventory levels of distillate fuel oil, and these stocks are in fairly good balance with estimated winter requirements. On October 17 inventories of distillate fuel oil totaled 131 million barrels, only 10 million above a year ago although they had been 17 million above 1952 levels only a month ago.

•

CALIFORNIA'S PICTURE is especially gloomy. West Coast demand has lagged behind the rest of the country. The inventory accumulation has been most severe on the Pacific Coast, constituting more than one-third of the total increase in stocks of the country as a whole.

Mid-October stocks of the four principal products in California totaled 57 million barrels, 23 percent higher than a year previous while the gain in the region east of California has amounted to only 9.6 percent. Motor fuel inventories in California on October 10 were 44 percent above a year earlier, while the rest of the country had only 14 percent more gasoline in storage tanks.

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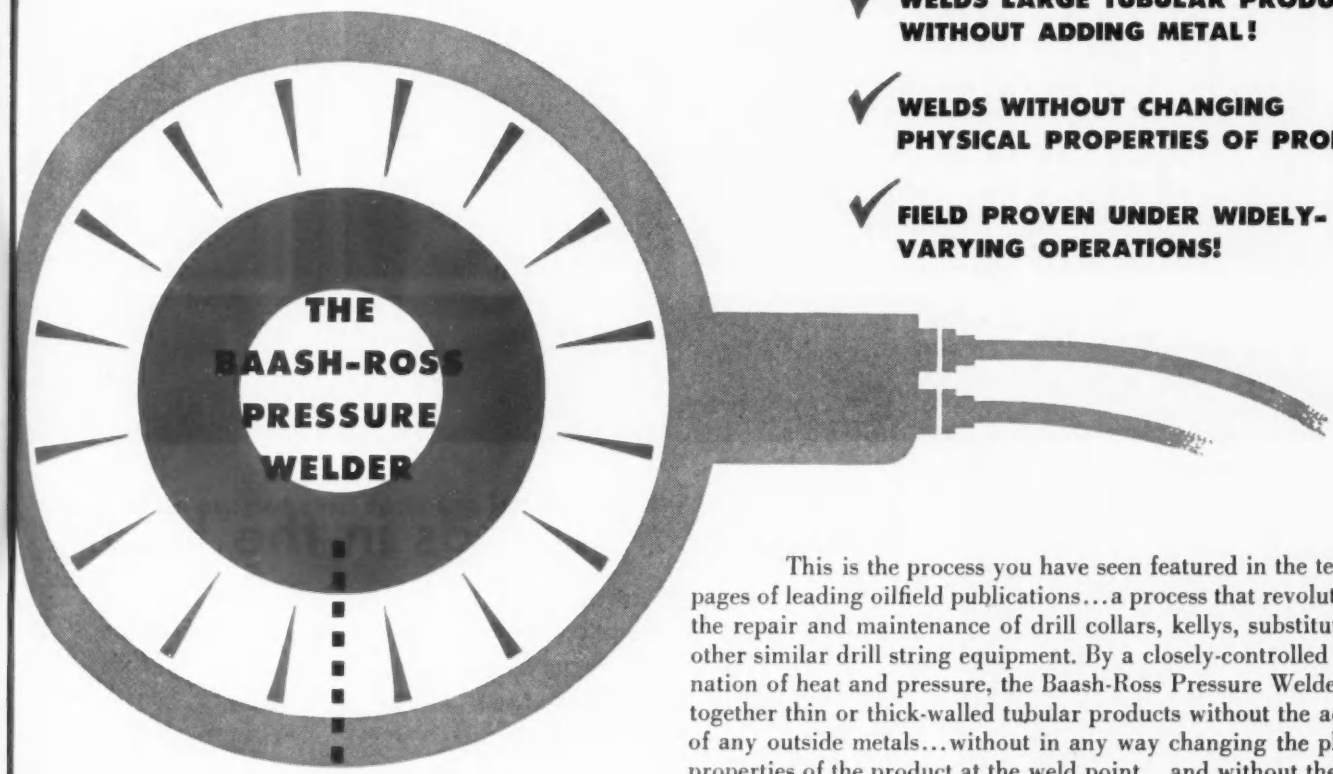

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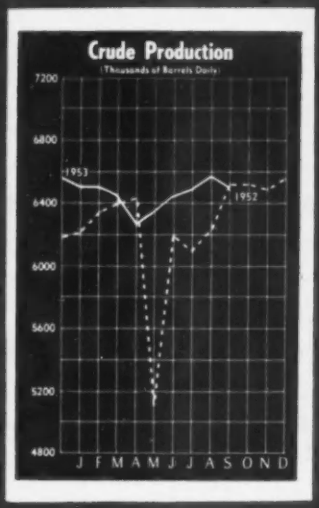
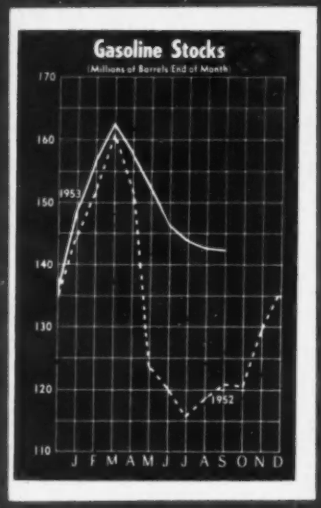
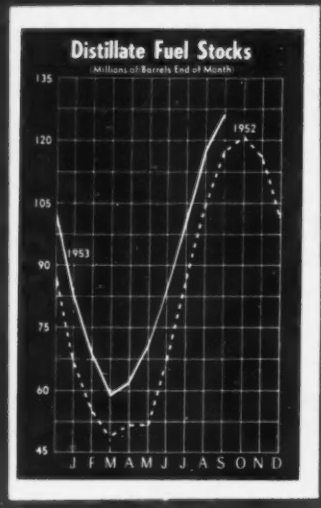
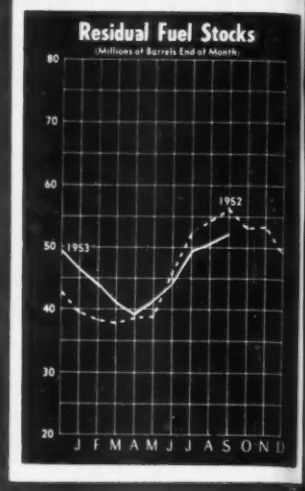
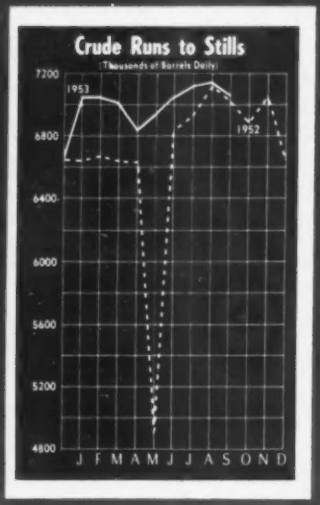
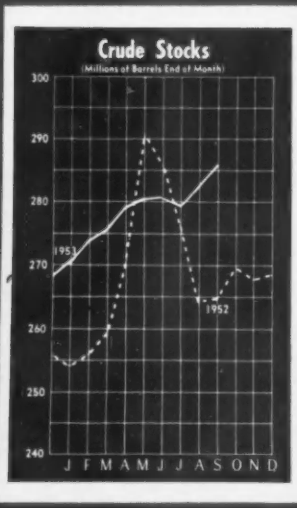












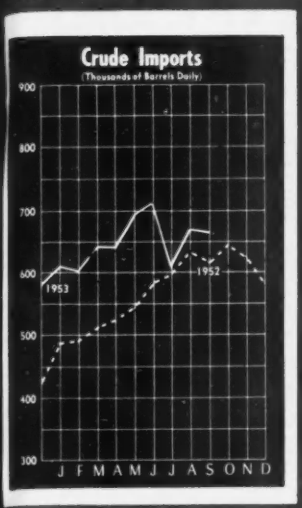
Petroleum Trends in the U. S. . . .

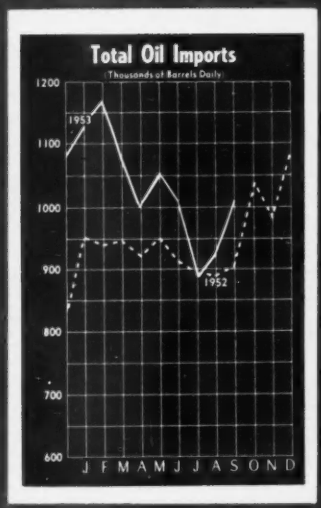
. . . some improvement shown in oil inventories

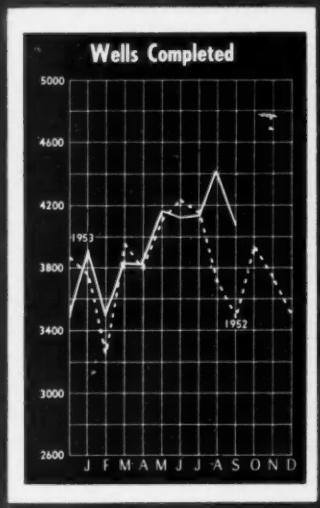
U. S. Crude Production by States

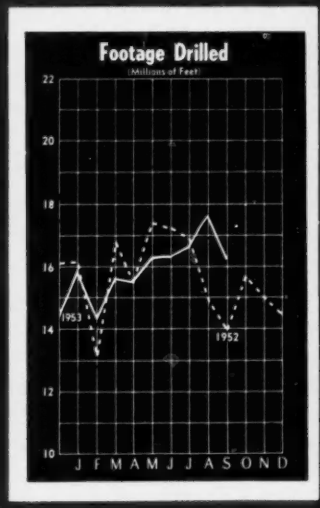
(Thousands of Barrels)

STATE or DISTRICT	DAILY AVERAGE PRODUCTION				TOTAL PRODUCTION First Nine Months		
	September, 1953	August, 1953	September, 1952	% Diff. September, '52-'53	1953	1952	% Diff. '52-'53
Alabama	5.2	5.1	2.2	+136.4	1,322	672	+ 96.7
Arkansas	78.2	77.7	80.8	— 3.2	21,991	22,044	— 0.3
California	1,000.6	1,007.6	982.6	+ 1.8	273,027	268,624	+ 1.6
Colorado	112.6	109.4	82.2	+ 37.0	24,790	21,515	+ 15.2
Florida	1.6	1.5	1.5	+ 6.7	409	452	— 9.5
Illinois	167.3	163.7	168.5	— 0.7	44,054	43,527	+ 1.2
Indiana	34.5	34.9	34.8	— 0.9	9,857	8,940	+ 10.3
Kansas	321.9	325.7	338.8	— 5.0	90,052	84,164	+ 7.0
Kentucky	31.5	31.2	31.3	+ 0.6	8,493	9,222	— 7.9
Louisiana	701.8	704.3	679.5	+ 3.3	192,527	178,320	+ 8.0
North Louisiana	109.7	109.9	113.8	— 3.6	31,138	31,832	— 2.2
South Louisiana	592.1	594.4	565.7	+ 4.7	161,389	146,488	+ 10.2
Michigan	32.4	32.6	33.9	— 4.4	9,159	10,015	— 8.6
Mississippi	96.2	96.5	99.3	— 3.1	26,740	27,132	— 1.5
Missouri	0.1	.0	0.1	. . .	16	17	— 5.9
Montana	33.0	35.2	29.2	+ 13.0	8,676	6,845	+ 26.7
Nebraska	15.7	16.8	7.8	+101.3	4,405	1,617	+172.4
New Mexico	199.2	197.1	171.2	+ 16.4	51,984	43,066	+ 20.7
New York	12.5	12.3	11.9	+ 5.0	3,028	3,226	— 6.1
North Dakota	12.8	14.4	5.9	+116.9	3,897	707	+451.2
Ohio	10.5	10.2	9.3	+ 12.9	2,619	2,389	+ 9.6
Oklahoma	551.7	555.4	540.4	+ 2.1	152,800	142,938	+ 6.9
Pennsylvania	28.1	27.6	30.5	— 7.9	7,963	8,452	— 5.8
Tennessee	. . .	0.1	. . .	. . .	9	7	+ 28.6
Texas	2,788.6	2,871.9	2,963.0	— 5.9	778,840	752,416	+ 3.5
Dist. 1—South Central	40.0	39.7	35.3	+ 13.3	10,197	9,061	+ 12.5
Dist. 2—Middle Gulf	154.7	161.7	172.9	— 10.5	43,454	42,955	+ 1.2
Dist. 3—Upper Gulf	468.7	476.6	501.5	— 6.6	130,185	127,919	+ 1.8
Dist. 4—Lower Gulf-S.W.	264.0	274.8	272.5	— 3.1	71,901	69,758	+ 3.1
Dist. 5—East Central	48.7	50.1	50.2	— 3.0	13,528	14,968	— 9.6
Dist. 6—Northeast	382.4	379.5	397.8	— 3.9	104,071	106,846	— 2.6
Dist. 7-B—North Central	117.0	119.8	105.0	+ 11.4	30,648	24,652	+ 24.3
Dist. 7-C—West Central	166.0	174.0	173.4	— 4.3	45,478	38,633	+ 17.7
Dist. 8—West	883.3	931.3	997.0	— 11.4	250,475	253,460	— 1.2
Dist. 9—North	188.7	187.9	183.1	+ 3.1	49,669	44,524	+ 11.6
Dist. 10—Panhandle	75.1	76.5	82.5	— 9.0	20,530	22,450	— 8.6
Utah	4.7	4.8	5.0	— 6.0	1,377	1,258	+ 9.5
Virginia	0.1	0.1	0.1	. . .	12	8	+ 50.0
West Virginia	9.3	8.5	7.0	+ 32.9	2,174	1,926	+ 12.9
Wyoming	245.0	243.6	200.8	+ 22.0	62,287	50,198	+ 24.1
Total United States	6,495.1	6,588.2	6,517.6	— 0.4	1,782,508	1,689,697	+ 5.5









By CECIL W. SMITH, WORLD OIL Staff

Crude output and refining lowest since May . . .

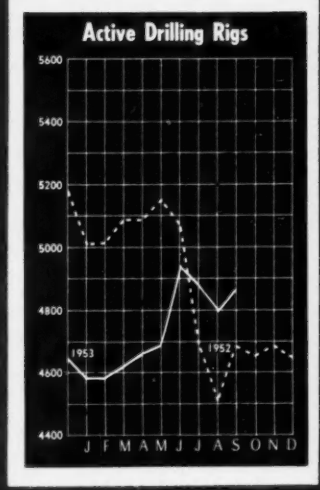
. . . imports hiked after three-months' ease.

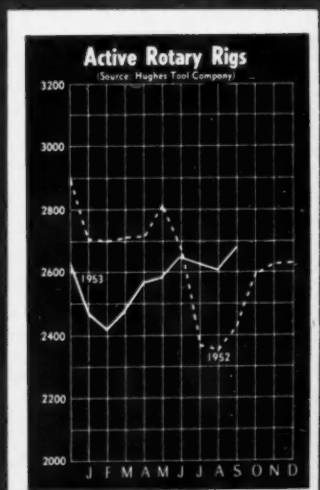
Crude Oil and Refined Products Trends

(Thousands of Barrels)

MONTH	CRUDE OIL			GASOLINE		DISTILLATE FUEL		RESIDUAL FUEL		DAILY IMPORTS	
	Production Daily	Runs to Stills Daily	Stocks End of Month	Production Daily	Stocks End of Month	Production Daily	Stocks End of Month	Production Daily	Stocks End of Month	Crude Oil	Total Oils
1951:											
August	6,232	6,539	254,276	3,114	124,202	1,237	94,028	1,226	48,365	529	780
September	6,261	6,558	254,900	3,127	124,530	1,282	104,082	1,228	49,608	500	744
October	6,375	6,446	262,266	3,105	118,864	1,295	109,544	1,224	49,573	421	769
November	6,272	6,609	261,100	3,130	122,723	1,358	101,666	1,304	46,491	425	802
December	6,182	6,646	255,783	3,150	134,867	1,442	86,619	1,313	42,853	423	834
1952:											
January	6,217	6,640	254,007	3,094	144,339	1,456	66,969	1,338	39,523	488	951
February	6,367	6,673	255,900	3,109	151,912	1,528	55,369	1,322	38,295	491	940
March	6,388	6,640	259,126	3,069	160,689	1,400	48,750	1,274	37,971	510	947
April	6,429	6,435	270,679	2,995	151,890	1,312	51,634	1,253	38,561	539	922
May	5,107	4,905	290,813	2,295	123,656	982	51,648	979	38,821	545	951
June	6,197	6,825	285,964	3,169	120,166	1,455	65,911	1,228	45,688	581	911
July	6,093	6,927	275,951	3,295	116,566	1,475	85,775	1,237	52,245	597	892
August	6,219	7,118	264,368	3,377	118,592	1,514	104,257	1,252	54,061	632	879
September	6,518	7,017	264,723	3,428	120,991	1,502	117,252	1,230	56,200	615	932
October	6,518	6,883	269,776	3,301	120,062	1,458	120,721	1,203	53,052	643	1,037
November	6,487	7,049	267,852	3,416	129,509	1,510	116,096	1,299	53,069	624	984
December	6,634	6,952	271,928	3,361	136,028	1,509	99,582	1,302	48,706	603	1,165
1953:											
January	6,555	7,042	272,250	3,384	150,518	1,528	80,655	1,307	45,910	616	1,135
February	6,562	6,969	273,589	3,379	157,873	1,505	67,167	1,275	44,178	586	1,066
March	6,531	7,002	275,665	3,319	162,731	1,489	59,802	1,256	41,600	655	1,112
April	6,446	6,781	280,487	3,282	158,032	1,424	61,349	1,219	39,572	628	1,010
May	6,390	7,002	280,308	3,459	156,415	1,400	73,706	1,197	41,795	703	1,096
June	6,595	7,081	283,715	3,467	146,196	1,462	84,504	1,238	43,801	707	1,050
July	6,603	7,103	284,976	3,583	143,916	1,441	102,258	1,224	47,530	629	950
August	6,588	7,128	282,287	3,571	143,162	1,452	118,158	1,233	50,946	673	926
September	6,495	7,044	286,431	3,497	142,906	1,430	126,694	1,222	51,922	672	1,015
Sept., 1953 Change:											
In Month	−93	−84	+4,144	−74	−256	−22	+8,536	−11	+976	−1	+89
In Year	−23	+27	+21,708	+69	+21,915	−72	+9,442	−8	−4,278	+57	+83
Week Ended:											
10-17-53	6,311	6,866	287,831	3,446	142,796	1,485	130,902	1,180	53,103	649	984
10-18-52	6,517	6,898	266,466	3,433	122,002	1,449	120,937	1,209	54,450	762	1,095

Source: Data for last two months from API; prior monthly data from Bureau of Mines.





Leach Calls for a Unified Front Within the Oil Industry

All phases of related efforts which go to make up the "oil business" are awakening to a basic piece of philosophy which is new to some, old to others. It is this: what helps the oil industry, helps all phases of it; what hurts the industry, hurts individual segments of it.

J. S. Leach, chairman of the board, The Texas Company, urged at the 34th annual meeting of Texas Mid-Continent Oil and Gas Association that the oil industry keep its own house in order and present a unified defense when the industry is attacked "either through ignorance or through plain malice."

Admitting that problems confronting the oil industry are as serious as ever before, Leach asserted that their solution will demand all the industry's ability, ingenuity and good will.

In particular, the problems exploited before the public by those "who wish to 'regulate' our industry are price increases, depletion and imports," Leach enumerated.

In supporting crude price hikes, he turned to fundamental economics. Even that put the oil industry in a creditable light. As with other commodities, costs incident to the exploration, producing and refining activities have risen markedly. But the combined price of petroleum products—including crude and refined products—has increased less than 5 percent since 1948. In the same period, Leach reminds, the increase for all commodities, excluding food and farm produce, averaged 11 percent, or more than twice as much.

In behalf of the present 27½ percent depletion allowance, Leach said the risk-filled, costly effort required to find oil is unlike any other business. The difference, he pointed out, is that oil production concerns the sale of a basic asset that is completely consumed as it is used. On the other hand, many other businesses accumulate basic physical assets and manufacture products which have some salvage value.

"No one," Leach says, "has suggested that the risks and hazards of oil production are less today than they were 27 years ago. Yet, there is agitation to do away with this protective depletion allowance altogether."

"Should that incentive be removed, our domestic oil supply would diminish. There would not only be less new exploration and drilling, but stockholders and employes would have to accept lower returns so that development of present oil sources could continue."

Then, Leach said, the excess available crude which the petroleum industry maintains above withdrawals would disappear in a relatively short time, with resulting permanent damage to the nation's security and economy.

General Ernest Thompson, chairman, Texas Railroad Commission, "has stated that the cushion above current production set by the PAD does not exceed 600,000 barrels a day," Leach said in connection with the imports issue. "Now, the imports of crude have been running about 650,000 barrels a day. Take away imports, we would have no such cushion for our own security. In fact, we would be on the dangerous borderline between supply and demand."

And the Texas Company executive said that each year national daily consumption has increased by an additional half million barrels. If present oil imports were cut off and if that consumption increase continued, he said the nation "could well face another period of rationing and stringent controls."

Iranians Are Finding the Price Was High

To extremely nationalistic Iran, ouster of Anglo-Iranian Oil Company was a victory. But economically, it was a hollow one.

During former Premier Mossadegh's reign, Iranians got what they thought they wanted. They got rid of the British. But with the ascension of Fazlollah Zahedi as premier, they found out the price. Heretofore, outsiders totaled up the nation's loss, but their figures fell on deaf ears.

Now, Premier Zahedi has published some figures, pointing to an over-all loss of more than $271 million, which include the loss of previous normal revenues from petroleum, field operating deficit and cost of placing the Abadan refinery back on stream.

Thus, Premier Zahedi appears to be gingerly laying the groundwork so necessary in Iran for further negotiations with the British. The premier has described the oil industry as his country's principal source of revenue.

Additional indications that Zahedi's administration apparently wants to forestall continuing losses of petroleum income are Zahedi's evaluation of the problem: the oil controversy must be settled to allow national reforms.

Therefore, it now appears almost certain that Zahedi will further test public reaction toward renewing oil talks with the British or an intermediary. If it then appears that the talks can proceed without demonstrations, Zahedi can be expected to seek audience with the parties involved.

Why Prices Cut

Reduced export demand for lubricants and competition from Mid-Continent refiners were among the causes of the cut of 50 cents a barrel in Pennsylvania grade crude prices September 1.

Bradford and Middle Pennsylvania crudes were lowered to $4.05 a barrel, Southwest Pennsylvania to $3.61, Eureka, West Virginia, to $3.55, and Buckeye, Ohio, to $3.54. Last previous changes were increases of 15 cents February 16, 1953, and 13 to 15 cents August 1.

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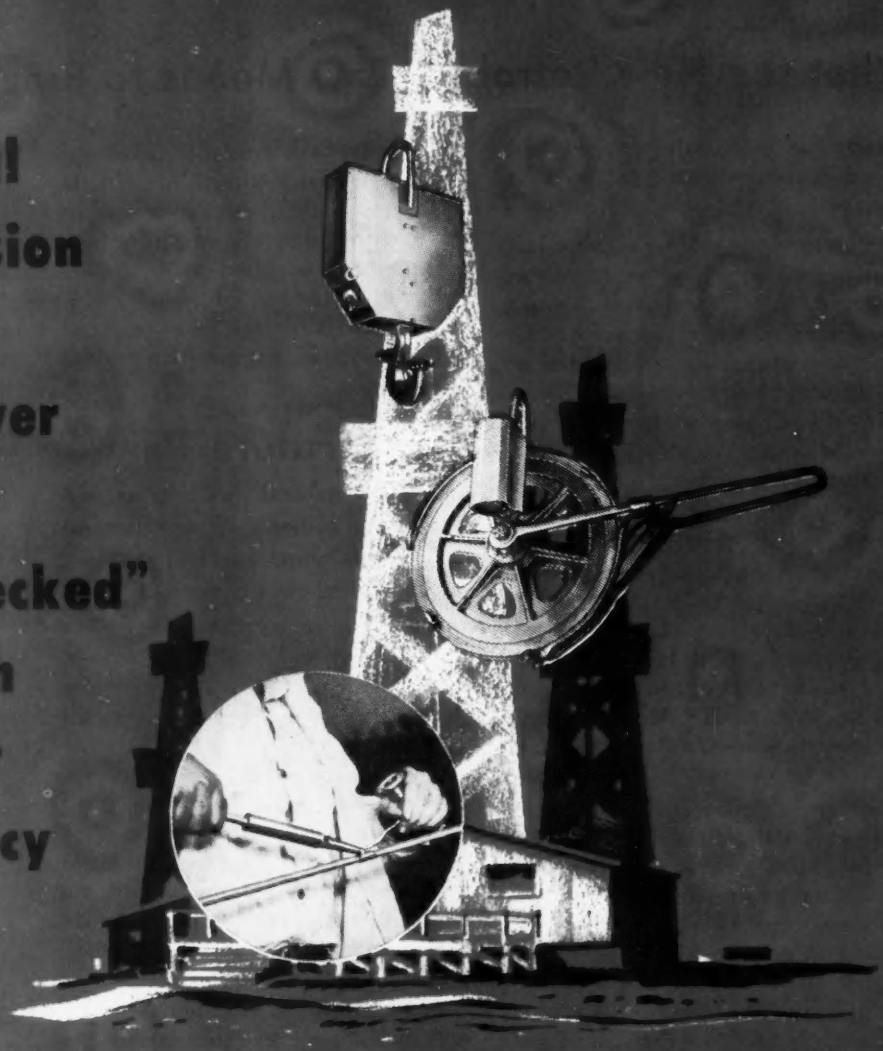


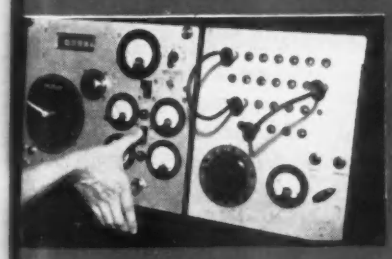
It may be a little difficult to think of cables and sheaves as "precision instruments," but those used in Lane-Wells perforating are just that — for the following reasons:

Every one of Lane-Wells armored **conductor cables** is flagged and individually calibrated. Its variations under load and depth are accurately charted and recorded. Using the stretch figures for the cable which is being used, the perforating operator can really pin-point the position of the gun.

Each **measuring sheave** over which the cable runs has a built-in micrometer adjustment to compensate for even the slightest wear, guaranteeing continuous accuracy of the rim of the sheave.

The **weight indicator** is built around a precision-formed helical spring whose performance characteristics have been accurately determined by repeated tests, and which is sensitive to the slightest variation in load.

Working with precision instruments like these, it's no wonder that Lane-Wells depth measurement accuracy is conceded to be "the standard of the industry"!



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What the New Petrobras Law Means to Brazilian Oil Industry

Brazil has oil in the ground and the government plans to keep it there.

President Getulio Vargas early last month signed into law the Petrobras bill which, in effect, decrees Brazil's oil will stay in the ground. The law which was finally enacted after more than 15 years of legislative and diplomatic discussions creates Petroleo Brasileira S. A., known as Petrobras, and gives this company an outright monopoly over petroleum production, refining and transportation.

Foreign participation of any kind —even as contractors to the company or technical advisers—is prohibited. The government will hold 51 percent of the stock of Petrobras and shares may be sold to Brazilian nationals only, specifically excluding Brazilians who may be married to foreigners.

Such a detailed law leaves no doubt as to the Brazilian intention. The law does permit existing refineries owned by private capital to continue operation but Petrobras is authorized to acquire 51 percent of the stock in any such company it desires. Privately-owned refineries are prohibited from further expansion. Existing concessions for operation of pipe lines will also be honored, though no new facilities may be constructed and no new concessions will be granted.

What Brazil hopes to accomplish is uncertain. In his previous administration from 1937 to 1941 Vargas all but nationalized the petroleum industry and limited foreign participation to marketing operations. Brazilian-owned companies under the various decree laws of Vargas could explore for and produce oil, but because of the many restrictions in the law, no company was organized.

Government efforts to produce oil in the interim before the recently passed law were only meager. Current domestic crude oil production is 2600 barrels daily in face of a demand in Brazil for 125,000 barrels per day of petroleum products. This domestic demand obviously is held down because of the government's chaotic financial condition which restricts imports. Crude imports in the first five months of this year (for which figures are available) averaged 5600 barrels daily, indicating that the remainder of the domestic petroleum requirements after allowance for local production was filled with refined product imports of more than 115,000 barrels daily.

The record of the Brazilian government in the oil business to date indicates little will be done to relieve the serious drain on the nation's economy required to pay for refined product imports. Competent observers say the nation does not possess the financial or engineering resources to undertake exploration and production of oil.

Bright Future Painted for Natural Gas

What is natural gas' role in supplying the nation's energy requirements? How important is it that consumer-wanted gas be supplied?

Extremely important is L. F. McCollum's answer to both questions. And widely shared is the opinion of the Continental Oil Company president, expressed at the recent Independent Natural Gas Association of America meeting at Houston.

Emphasizing that the astronomical numbers representing the volume of natural gas used in this country are almost beyond comprehension, McCollum pointed to natural gas' ever-increasing importance.

For example, in 1925 about 70 percent of U. S. energy requirements was met by coal and about 27 percent by oil and natural gas. In 1950, coal supplied but approximately 40 percent, and oil and natural gas, 44 percent. He said that currently oil and natural gas supply about 60 percent of the total.

It must be remembered, McCollum explained, that "during all of these years energy requirements have been expanding at a rapid pace—but the rate of expansion in uses of gas outstripped the rate of increase in total energy requirements."

"Natural gas production better than trebled from 1940 through 1952, while there was only a 53 percent increase during the same period in the production of all other mineral fuels, when expressed in terms of heating value units."

Pointing further to natural gas' role, McCollum said that while natural gas weighs only about 62 percent as much as air, the total weight of natural gas marketed in 1952 was approximately twice the total tonnage of steel produced by all the steel mills in the U. S. last year!

This expansion is logical. Consumers preferred natural gas over other available fuels for two reasons: they found it clean and efficient; the price was right.

Concerning relationship between price and consumption, the President's Materials Policy Commission reported in 1952 that "the potential demand for natural gas at or near present prices to consumers far exceeds the amount currently being marketed . . . The excess demand will eventually have to be squeezed out either by company or governmental allocation or by such increases in price at points of consumption as will make the energy costs of natural gas comparable in competing uses with the cost of other fuels, with allowance for difference in convenience of use . . . "

". . . Total residential and commercial demand may more than triple by 1975 . . .", the report added, and ". . . it can reasonably be expected that by 1975 half of the homes in the country will be heated by natural gas."

The report added a further projection: If exploration should be active enough to support a growth in domestic petroleum production in proportion to consumption, it would be likely also to support a natural gas production level in 1975 of well over 20 trillion cubic feet."

These quotations, says McCollum, pose the question squarely: Is exploration between now and 1975 going to be active enough to meet a demand of about 2½ times that of 1952, or will what the report called "excess demand" have to be squeezed out by arbitrary allocations?

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ANOTHER LEADING OIL PRODUCING AREA WHICH HAS DEPENDED ON BIW EQUIPMENT.

« Continued from Page 65

with the policy, each independent operator will be slow to condemn any shipment of foreign oil that meets the test of supplementing and not supplanting domestic oil.

Consider Demand? In criticizing imports, Texas independent producers have advocated that importing companies should consider U. S. market demand, in determining their imports, just as the Texas Railroad Commission considers market demand in determining allowable crude production in Texas. That this principle should be practiced appears to be a reasonable idea.

Basically responsible for the friction over imports, as stated before, is the present large excess of world oil producing ability, including over a million barrels a day of surplus capacity in the U. S. The difficulty could be relieved by curtailing imports, but it also could be relieved if demand were increased to absorb a substantial part of surplus producing capacity. Therefore, much can be done toward softening the effect of imports by promoting maximum use of oil both in the U. S. and abroad.

Toward this end, petroleum industry research can be very helpful by developing new, large-scale uses for petroleum products. Research of this kind should now be intensified.

In so far as the American economy in general is further expanded, there will be increased need for fuels and other petroleum products. Therefore, good business in general should be sought and promoted by the petroleum industry as one of the means of creating strong demand for all the oils that can be produced in the U. S.

Finally, the U. S. and the petroleum industry in particular should be interested in promoting increased use of petroleum products in the other countries of the world, through greater mechanization of industry and farms abroad. Increased use of trucks, tractors, automobiles, Diesel locomotives, and other oil using devices in foreign countries would raise living standards, promote free enterprise and democracy abroad, and create greater demand for petroleum products. With foreign consumption greater, oil exporting countries could find new markets and be less dependent upon the U. S. for markets. —**The End.**

The Courts Say . . .

in recent insurance cases

Shelton

This column is to inform—not advise. It presents the current trend in legal thinking on insurance cases. The law varies from state to state and its application depends upon the facts of the particular case. Do not attempt to apply it without consulting your attorney.

JOSEPH M. SHELTON, Attorney-at-Law, Dallas

That intoxication bars, though started by employer.

EMPLOYER AND EMPLOYE had come to city on business of the employer. In the hotel that night the employer produced a bottle and both began drinking. After an extended evening, both were highly intoxicated. Somehow the employe fell from the seventh floor hotel room window and was killed. Insurance carrier said employe was not in the course of his employment because the injury was received while in a state of intoxication. Plaintiff said the defense of intoxication did not apply because the employer originated and participated in the drinking activities of the deceased.

The court said the Texas law is plain and unambiguous in declaring that an injury received while in a state of intoxication is not an injury sustained in the course of employment. The participation of the employer has no bearing on the situation.

—Smith et al v. Traders and General Ins. Co. 258 SW 2d 436 (Tex. Civ. App.—Eastland, 1953)

That unexplained death on job infers work accident.

DAY LABORER died within 15 or 20 minutes after starting work on a day which most lay witnesses called "very hot." Death certificate showed cause, "Cerebro Vascular Accident." Laborer's dependent contended this was caused by a heat stroke and asked compensation. Employer denied claim as not being an accident arising out of the employment.

The court said every reasonable doubt as to whether the act or injury of the employe arose out of the employment should be resolved in favor of the employe or dependent. There will be no compensation where cause of death is speculative, but where an employe is found dead at his post of labor, an inference arises that it was a work-connected accident. When such is the case, it is the burden of the employer to show it occurred otherwise.

Cunningham et al v. Hornbree, 257 SW 2d 12 (Tenn. Sup. Ct., 1953)

That injury resulting from a fight was compensable.

H——was the aggressor in a fight which resulted from the accusation that W—— had stolen his pistol from his locker at work. W——, who suffered an eye injury, claimed that H——, a day worker, had the pistol in connection with his work. This was contended because H——sometimes stayed at night to let trucks in and out and to see that the doors and windows were fastened. The employer urged that H—— wasn't required to have a pistol and he didn't know he had one; that the whole fight was a personal matter between the employes.

The court said it's reasonable to expect that an employe who is required to stay in a place of business would have a weapon for self-protection. There is, therefore, a connection between the conditions under which the work is required to be performed and the resulting injury and the injury is compensable.

—Jim Reed Chevrolet Co. et al v. Watson, 254 SW 2d 733 (Tenn. Sup. Ct., 1953)

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• U. S. Wells Completed in September and First Nine Months, 1953

STATE or DISTRICT	NEW WELLS COMPLETED AND FOOTAGE DRILLED																Rigs in Operation		
								TOTAL NEW WELLS			Total Footage September, 1953	DETAILS FOR JANUARY-SEPTEMBER							
												New Wells			Footage				
	Oil	Dist.	Gas	Dry	Water Input	Gas Input	Water Disposal	Sept., 1953	Aug., 1953	Sept., 1952		1953	1952	Percent Diff.	1953	1952	Sept., 30, 1953	Aug., 31, 1953	Sept., 30, 1952
Alabama	1			8				9	11	5	50,885	79	48	+ 64.6	413,508	282,790	7	8	5
Arizona												6	1	+500.0	19,960	3,544	1	3	4
Arkansas	26		1	27				54	48	39	207,031	367	305	+ 20.3	1,320,850	1,132,251	53	51	41
California	127		2	59				188	246	189	792,620	1,914	1,863	+ 2.7	8,273,800	7,898,141	259	257	261
Colorado	28	1	1	35				65	88	46	348,863	515	329	+ 56.5	2,637,799	1,773,544	60	46	42
Florida				5				5	3		45,345	28	6	+366.7	180,362	39,081	3	5	1
Georgia				1				1	1		4,008	5			13,756		3	4	1
Idaho												4			22,748		2	1	3
Illinois	97			93				190	217	188	502,739	1,464	1,509	— 3.0	3,658,598	3,716,684	245	234	190
Indiana	44			75	1			120	116	98	190,703	981	956	+ 2.6	1,663,291	1,694,111	162	179	157
Kansas	138		36	151			4	329	436	314	1,153,491	3,457	3,197	+ 8.1	11,977,677	11,087,501	430	452	403
Kentucky	44		16	55				115	130	112	233,623	881	885	— 0.5	1,742,313	1,812,674	95	103	90
Louisiana	139	5	31	81				256	224	206	1,696,823	1,883	1,727	+ 9.0	13,393,778	11,523,752	266	247	218
North Louisiana	65	1	10	40				116	91	122	431,548	805	948	— 15.1	2,995,870	3,606,904	59	59	70
South Louisiana	74	4	21	41				140	133	84	1,265,275	1,078	779	+ 38.4	10,397,908	7,916,848	207	188	148
Maryland									2	3		4	32	— 87.5	15,614	124,967	1	1	11
Michigan	17		1	32				50	67	42	118,852	448	486	— 7.8	1,162,099	1,314,981	117	100	89
Mississippi	9	1	2	17				29	31	23	203,025	287	259	+ 10.8	1,993,326	1,857,082	43	39	37
Missouri	6			2				8	2	4	6,252	25	29	— 13.8	20,645	30,090			3
Montana	24		1	39				64	26	39	222,093	326	198	+ 64.6	1,425,135	644,985	57	72	68
Nebraska	15			18				33	25	31	172,955	255	173	+ 47.4	1,322,398	875,828	18	21	17
Nevada				1				1	1		600	8			11,115			1	1
New Mexico	63		57	22				142	110	98	790,935	1,103	835	+ 32.1	6,259,005	4,639,027	178	208	173
New York	50				30			80	94	112	110,110	691	807	— 14.4	963,889	1,120,757	105	115	127
North Carolina									1			1			1,570				
North Dakota	13			12				25	26	9	164,164	189	42	+350.0	1,418,677	375,960	32	29	30
Ohio	33		15	27				75	94	70	165,941	721	706	+ 2.1	1,482,882	1,532,240	189	187	171
Oklahoma	362		37	202	2		2	605	732	398	2,107,068	5,389	4,258	+ 26.6	18,985,841	16,088,905	596	568	574
Pennsylvania	59		7	2	48	11		127	161	148	209,485	1,212	1,275	— 5.0	2,089,035	2,154,353	244	290	277
South Dakota									6	1		14	3	+366.7	70,258	16,221	3	2	1
Tennessee				1				1			2,269	1			2,269				5
Texas	704	28	65	520	8	1	2	1,328	1,363	1,221	6,120,735	12,540	13,580	— 7.7	57,525,595	65,549,405	1,327	1,226	1,363
Dist. 1 South Central	41		1	30				72	60	87	203,881	614	566	+ 8.5	1,982,968	1,666,739	28	27	42
Dist. 2 Middle Gulf	25		10	31				66	66	49	383,481	586	613	— 4.4	3,618,643	3,923,794	38	43	49
Dist. 3 Upper Gulf	72	10	5	57			1	145	118	163	969,505	1,234	1,359	— 9.2	8,339,112	9,014,451	138	124	134
Dist. 4 Lower Gulf-S.W.	55	15	12	52				134	166	101	756,049	1,380	1,241	+ 11.2	7,938,689	6,591,364	100	79	92
Dist. 5 East Central	4	1	1	10				16	18	31	72,031	215	275	— 21.8	865,136	1,390,117	11	11	19
Dist. 6 Northeast	14		11	22				47	35	33	303,508	371	412	— 10.0	2,225,928	2,540,690	51	42	36
Dist. 7-B North Central	131		4	114				249	252	190	770,133	2,323	2,078	+ 11.8	7,539,716	6,592,751	174	156	137
Dist. 7-C West Central	39	2	1	37	2			81	110	126	367,943	1,011	1,617	— 37.5	4,960,059	9,546,807	130	121	178
Dist. 8 West	145		2	49	1			197	196	185	1,195,964	1,685	2,549	— 33.9	9,718,988	15,068,717	344	325	303
Dist. 9 North	142		4	116	5	1	1	269	280	228	934,434	2,730	2,395	+ 14.0	9,121,354	7,693,831	227	215	299
Dist. 10 Panhandle	36		14	2				52	62	28	163,806	391	475	— 17.7	1,215,002	1,520,144	86	83	74
Utah	1			2				3	5	11	17,497	58	55	+ 5.5	324,809	363,922	21	19	26
Washington																	1	1	
West Virginia	11		29	6				46	66	40	117,927	466	443	+ 5.2	1,300,913	1,320,759	215	209	204
Wyoming	66		2	28				96	83	42	450,734	594	450	+ 32.0	2,968,724	2,279,363	146	119	94
Total United States	2,077	35	303	1,521	89	12	8	4,045	4,415	3,489	16,206,773	35,916	34,457	+ 4.2	144,662,239	141,252,218	4,879	4,797	4,687
Total Western Canada	73		17	78				168	275	182	703,006	1,553	1,379	+ 12.6	6,450,096	5,730,715	130	149	181

Completions Decline

But September's total is still far ahead of same period last year.

WELL COMPLETION rates during September dropped from the record-breaking level of the previous month, but still they were far ahead of operations in steel-short September, 1952. An all-time high for any month was reached when 4415 new wells went into the records for August, but the latest count of 4045 dropped September back to the lowest level since April.

Still the year's operations maintained a substantial lead over last year's activity and even widened the margin despite the slack-off during September, for it was during the same month a year ago that the full brunt of the steel strike's pipe shortage was felt. At the end of August, wells completed this year topped last year's record by 902 wells or 2.9 percent, while the current difference amounts to 1459 wells and the gap has widened to 4.2 percent.

The amount of footage drilled in this year's wells has not quite kept pace with the number of wells. To date, a total of 144,662,239 feet has been penetrated in 1953's new wells and that amounted to a gain of 2.4 percent over the 141,252,218 feet drilled in last year's holes. On the average, this year's tests have been drilled 4028 feet, while in the comparable period of 1952, depths averaged 4099 feet.

Results of this year's nine-months efforts have been 18,473 oil producers, which amounted to 52.8 percent of all wells drilled in search of production. A year earlier, the number of oilers was a smaller 17,873, but they amounted to a better 53.4 percent of the total. Distillate wells numbered 267 and 272 respectively, and they accounted for 0.8 percent in each case.

Gas well completions have totaled 2676 this year for a score of 7.7 percent of the total drilled, but a year ago 2392 gassers accounted for only 7.2 percent. In all, 21,421 wells have proved successful in 1953 for 61.3 percent, while in 1952's same period, total producers amounted to 20,532 and 61.4 percent.

Dry holes totaled 13,537 this year, and 12,918 last year. They amounted to 38.7 percent and 38.6 percent of total drilled, respectively.

MAKING SAFETY A HABIT is a prerequisite of a good program. It will lead to many intangible benefits besides saving money and preventing accidents. Here members of a seismograph crew plug a shot hole with dirt and rocks to prevent a mishap to livestock. Such action will win good-will for a company and might avoid a law suit.

Safety Starts at the Top

• The safety director needs the help of high officials and supervisors in planning a program.

• The party chief and supervisor ramrod the program among the crews.

• A committee of workers can point out hazards and help in eliminating them.

• Regular meetings and publicity will help keep interest in the program high.

By JOHN F. IMLE, Geophysical Service, Inc., Dallas

EXPERIENCE INDICATES that effective safety work in any company must stem directly from top management. Safety must be recognized officially as an integral part of operation. It, therefore, becomes a function of the operating official, and its success will be in direct proportion to the amount of active interest and leadership displayed by him.

In many organizations with successful safety programs, executive control has been obtained by appointment of an assistant to direct and supervise the program. His function is to advise management in matters of safety. He may be given the title of safety director or a suitable equivalent, and he may be on a full time or part time basis as conditions warrant.

Employes must be made aware from the very beginning that management is vitally interested in accident prevention and is giving the program its fullest support. It is not enough to set up a program, and then sit back with a satisfied feeling of sufficiency. Management must follow up by speaking directly to employes and by making certain that supervisors and party chiefs fully understand the responsible and important parts they are to play in the success of the program. Once those line employes are made to realize that fact, the battle of accident prevention is well under way and perhaps half won.

Safety activities require constant direction. Although the cooperation of officials and supervisors with the

work of the safety director is deemed of greater importance than the authority vested in him, the position occupied by the director usually governs, in part, his ability to secure such support. In many cases his rank also indicates the importance attached to safety by the management, thus largely determining the attitude of supervisors and party chiefs toward the program and the extent of cooperation on the part of employes.

The accident prevention program should be the first, if not the sole, responsibility and duty of the director of safety. Nothing will defeat the program more quickly than to let it become known among employes that safety work is done after "more productive" duties. Preach "safety first" and display that attitude all through the program.

The director of safety should be a person with a sincere personal interest in human relations. He should possess enthusiasm for the program, and the ability to become a friend of every employe and a respected leader of men. In addition, a general knowledge of the operating principles and problems of the geophysical industry and possession of an engineering background are considered essential assets.

Planning, coordination, and supervision are required. Inadequate study of company requirements or the lack of careful planning is often attributed as the reason for the failure of a safety program.

After the operating officials have decided that a safety program is justified, and following his appointment the safety director usually begins by making a thorough study of the previous and current accident experience of the company. Based upon this study the plan of procedure is then prepared and discussed with officials and supervisors in order to secure their support and suggestions.

Upon approval by management the plan is presented by operating official to a meeting of supervisors. Letters and employes' meetings are utilized to announce the company's safety policies and program to the field force.

After the program is in force, frequent inspections should be made to determine if all recommendations have been placed in force and to detect lapses in safe practices. Such inspections should be made unannounced at irregular times and places, so that workers and party chief alike will not know when to expect them.

These inspections afford an opportunity for the safety director to interpret to the workers the company's safety policies, that the real motives underlying them may be fully appreciated and the position of operating officials regarding safety clearly realized.

Supervision of the safety program at the crew level should be made the duties of the party chief and supervisor—the men who are closely and constantly in touch with the work and with personnel. They might well apply the four steps in basic accident prevention technique which are:

1. ANALYZE THE JOB. This is the first step in effective accident prevention. Break down each job into its specific steps or actions.
2. SPOT THE HAZARDS. After the job is carefully broken down, analyze the steps or actions. Determine where the hazards exist.
3. CORRECT THE HAZARDS. Obviously, after the hazard has been spotted, the next step is to correct it. The three best methods for doing this are job safety instruction, changing the work method or equipment, and "selling" the use of personal protective equipment.
4. FOLLOW-UP. In accident prevention techniques, the follow-up is the hardest. It is hard to keep up interest and to keep people from backsliding as time goes on. But because the follow-up part is the one in which the program so often fails, it's the key to real success in preventing accidents.

A well-planned program assures best results. The backbone of successful geophysical safety programs is the crew safety committee composed entirely of key field personnel. In most field crew organizations the observer is the man in charge of the field operations, hence, he is the logical person to head the safety committee. One man from each unit of the field crew should be on the committee with preference given to seniority.

In selecting a safety committee, natural leaders and key personnel should be chosen. This should be the case, however, only if these individuals are thoroughly convinced that accident prevention is important for an efficiently operated crew. If there are those whom management has not sold on accident prevention, such persons have no place on the crew safety committee.

The duties of the safety committee are:

- Analyze the various jobs for hazards and recommend that these hazards be removed.
- Investigate all accidents for their causes and recommend steps to prevent recurrence.
- Call brief, on-the-spot safety meetings to discuss immediate hazards, procedures, accidents, etc.
- Report such meetings to the party chief for inclusion in the monthly report of crew safety activities.
- Indoctrinate new employes in safety and train them in safe working habits.

There is nothing so useful as a fact. A simple, workable accident record system should be established and should include copies of all accident reports and correspondence with reference to a particular accident. A monthly frequency and severity chart will help point out trends and may suggest causes. A record of lost time must be kept from which frequency and severity rates are computed. The accident file should contain also copies of supervisor's and party chief's accident reports. The company carrying the Workmen's Compensation Insurance will assist in setting up the record file and council members may call on the National Safety Council for such assistance.

Circumstances surrounding accidents are important. The supervisor and party chief should make an immediate and thorough investiga-

tion of all accidents independently of that made by the safety committee and, based on the findings, establish corrective measures at once. Very often, non-injury accidents point the need for corrective measures as emphatically as do injuries, and these should receive the same emphasis and attention. Close attention and active interest by management at this point in the accident prevention program often keeps the men more aware of the importance of corrective practices and makes them accept these practices more readily.

Well-organized safety meetings stimulate action and hold interest. Regular safety meetings are a most important part of accident prevention programs. These meetings must be designed to suit the particular group and the operations of that group. If the work involved is hazardous, it would be desirable to hold more frequent meetings than would otherwise be the case. It is believed that a maximum of one meeting a week and a minimum of one per month would suit most conditions of operations. A combination of weekly, on-the-spot meetings and the formal monthly meetings has been found by experience to be best.

Whenever possible safety meetings should be held at the beginning of the work day when, as a rule, men are fresh and think better. However, it often is impractical to hold a one-hour meeting at that time of day, but the 10-20 minute meeting can usually be held then. It has been found that Monday morning is a good meeting morning.

The one-hour evening or night meeting should be planned for such an hour that the men can have a chance to wash up, eat, and become a bit refreshed for the meeting. A time schedule should be set up and adhered to rigidly, as nothing becomes so boresome as a meeting that flounders. The length of the meeting should be determined by the program material. If a speaker is to talk on a specific subject, his talk should never be longer than 30 minutes. This may vary if he is giving instructions, or the men are taking notes. The meeting should not run longer than an hour under any conditions, as very few are able to absorb more than can be discussed in this length of time.

There are many topics for safety meetings. It is good to have experts or specialists talk on specific subjects or someone who is willing to do the necessary research in an effort to offer the best of information on the given topic. Safety films of all types are excellent safety meeting aids and are available from many sources.

Make the safety program a continuous sustained program. It is largely wasted effort to set up a good program and then not follow through earnestly and conscientiously. Variety and change of pace are essential in keeping geophysical employes interested and alert to the need for safety measures. Posters, booklets pamphlets, films, cartoons, etc., can be secured from a number of sources and will lend variety to what might be generally regarded as a dull subject.

About the Author

JOHN F. IMLE was graduated from the University of Texas in 1930 with a BS degree in electrical engineering. Since that time he has been in geophysical work, spending more than 12 years in the field of safety. He is now safety director for Geophysical Service, Inc. He is chairman of the Standing Committee on Safety of the Society of Exploration Geophysicists; member of the Central Committee on Accident Prevention, API; and a member and officer of the southwest chapter of the American Society of Safety Engineers. He holds memberships in the SEG, Dallas Geophysical Society, Dallas Geological Society, and the Mexican Society of Petroleum Geologists.

Accident prevention pays. The well-planned, sustained accident prevention program will without a doubt pay its own way. Some time may elapse before this becomes apparent in terms of lower insurance costs, but it should be in early evidence by increased production and better efficiency. An intangible result of effective accident prevention is in improved employe morale which often manifests itself in even more efficient production. Not the least consideration is that of good public relations. A company that has the reputation of being safety-minded generally is regarded in the community as a "good outfit to work for."

Does safety interfere with production? There is a tendency among geophysical people to look upon safety as a "thorn in the flesh" of production. That this is altogether a false impression has been proven time and again in actual practice. Studies have been made of individual plants and of whole industries employing many thousands of workers to find out if an efficient plant or industry is a safe one, and conversely, if a safe one is efficient.

The results of the study have shown that if a plant or industry is a safe one (having a decreasing accident rate), it is many times more likely to be productive or efficient than is the unsafe one (with an increasing accident rate). Although to our knowledge no such study has been made in the geophysical industry, there is no reason to believe that the results, if such a study were made, would not be comparable.

Every safety man is just as production-minded as is line management. Safety is designed to be a service to production management. It is not intended to hamper performance and, if properly applied, will not do so. In many instances a well-administered safety program helped production by improving the operations.

It has been established that there is a definite relationship between safety and production and that a more efficient and productive organization results if the operation is a safe one. Management, therefore, has much to gain from the application of sound safety practices and the utilization of available safety services.

—The End.

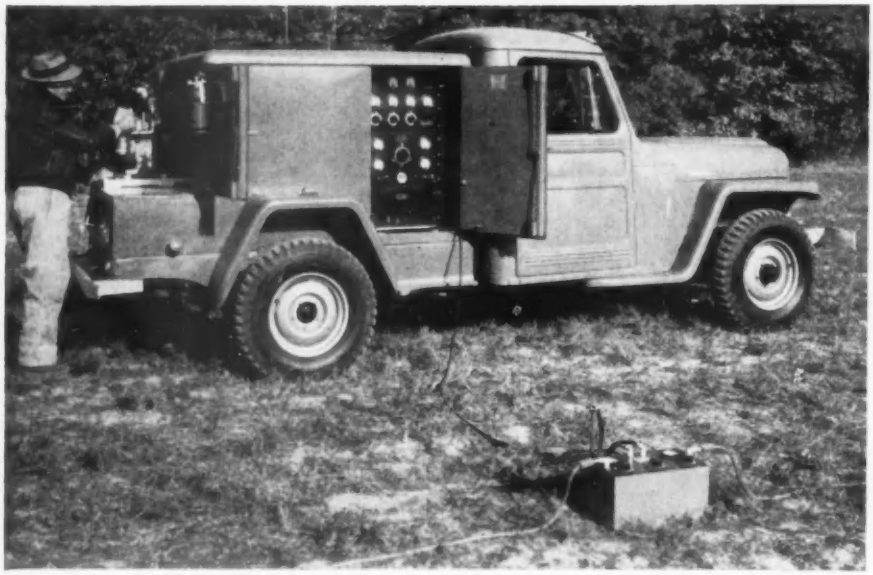

Fig. 1—Radoil exciter in operation.

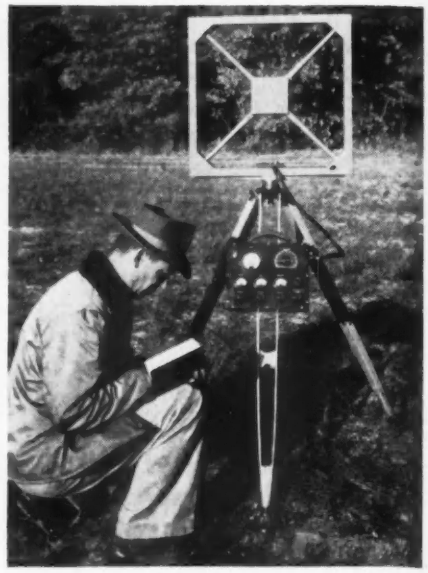

Fig. 2—Radoil receiver in operation.

New Oil-Finding Method Tested . . .

- **Radio transmission curves show boundaries of accumulations.**
- **Preliminary studies indicate direct evidence of oil.**
- **Success promised in probing stratigraphic traps.**

By R. B. PRATT, Geophysicist,
Petty Geophysical Engineering Company, San Antonio, Texas

A METHOD BY which direct evidence of an oil accumulation is indicated on radio-transmission curves has been developed and field tested with satisfactory results. When the transmitter is properly located and the receiver readings are taken across the edge of an oil deposit, the presence of the oil accumulation is shown by anomalies on the edge of the transmitter curves. The method was developed and patented by William M. Barret, Inc., of Shreveport, and is known as Radoil.

The technical equipment used consists of a transmitter (Figure 1) and a receiver (Figure 2). The transmitter is usually referred to as the "exciter." It generates electromagnetic waves at a constant frequency, and has a system of controls for keeping the amplitude of the electromagnetic waves constant. The antenna is directional and is oriented in line with the profile being run. The Exciter can be mounted on a light truck or trailer to suit terrain requirements. A 60-cycle, 110-volt gasoline-powered generator is included in the equipment to supply power for the unit. The receiver is portable and is designed to operate at constant gain when receiving the electromagnetic waves generated by the exciter. The receiver antenna is a square loop which is mounted on a Johnson-head tripod, and when in operation is leveled and oriented in line with the exciter by a compass. The receiver and its accessories are transported in another small truck which is also used to transport the receiver crew back and forth to the job. Two-way radio communication is provided between the exciter and receiver trucks.

The regular personnel of a field crew consists of a field party chief, an exciter operator, a receiver operator, and an assistant receiver operator. Where accurate land maps are available, satisfactory surveys can be made by pacing with a compass, but where good land maps are not available, a surveyor and a rodman should be added to the crew. At the present time the field data are processed, maps are drawn and interpretations are made in a central office.

In field operations, the exciter remains fixed in position for each separate profile and the receiver occupies

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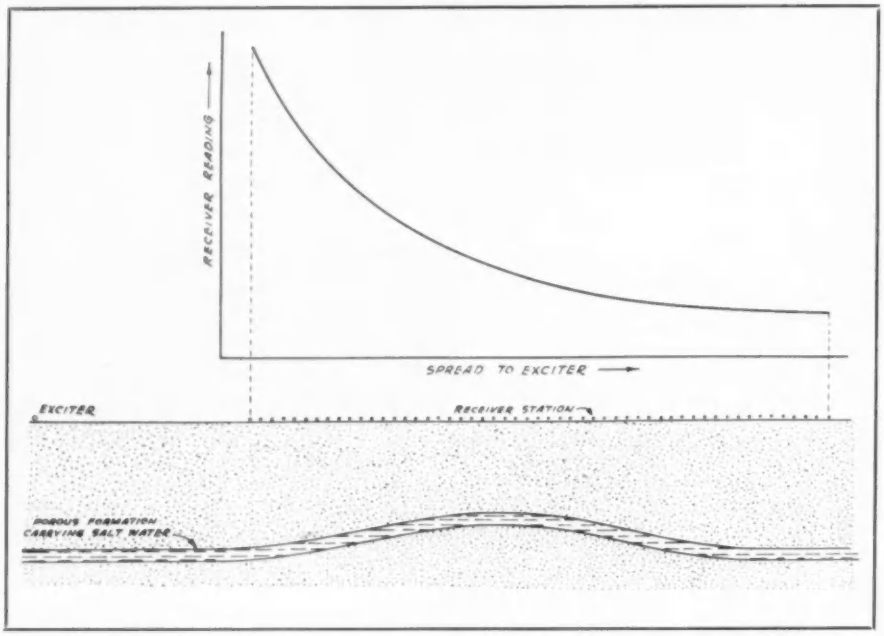

Fig. 3—Neutral profile over an anticlinal fold that carries no oil deposit.

About the Author

R. B. PRATT, geophysicist with Petty Geophysical Engineering Company, holds M. S. degrees in C. E. from the University of Texas and University of Illinois. He has been with Petty since 1933, engaged during this time with the interpretation of geophysical data.

successive stations along a straight traverse directed away from the exciter. After a series of readings have been made on a particular profile the exciter is moved to another location and the receiver occupies stations along the same or a different profile. The location of the exciter and the length of the profile is governed by the expected depth of the oil accumulation. Considerable technique is involved in maneuvering the exciter location to the somewhat critical position needed to obtain the diagnostic anomaly that is the definite indicator of an oil accumulation. The length of profiles is determined by the depth to be explored and may extend several miles from the exciter. Profiles are very similar to refraction profiles in length of lines and number of receiver stations.

Interpretation of data is largely empirical. In the original development of interpretation methods, it was discovered in studying the transmission curves over oil deposits that when the exciter was located in a certain position with respect to the edge of an oil accumulation, a definite type of anomaly would be found on the transmission curve over the near edge of the oil accumulation and this was called a "diagnostic anomaly." On the same curve or on other curves a different type of anomaly was observed over the far edge of the oil deposit which was called a "boundary anomaly." It was also found that if the exciter was too far out of position for a diagnostic anomaly, a boundary anomaly would be obtained over the near edge of the oil deposit as well as over the far edge. In the event that no oil boundary was present under the area surveyed, a "neutral curve," or a normal transmission curve, would be obtained. Idealized profiles illustrating these characteristics are shown in Figures 3 and 4.

With further reference to Figure 4, the diagnostic anomaly is considered to be direct evidence of oil and a pattern of these anomalies over a prospect is considered definite evidence of an oil accumulation. Anomalies of the boundary type are not necessarily indications of oil but must satisfy certain definite conditions and checks before being considered favorable indicators, and are never considered positive evidence of oil. However, a boundary anomaly may be the first clue to the location of an edge

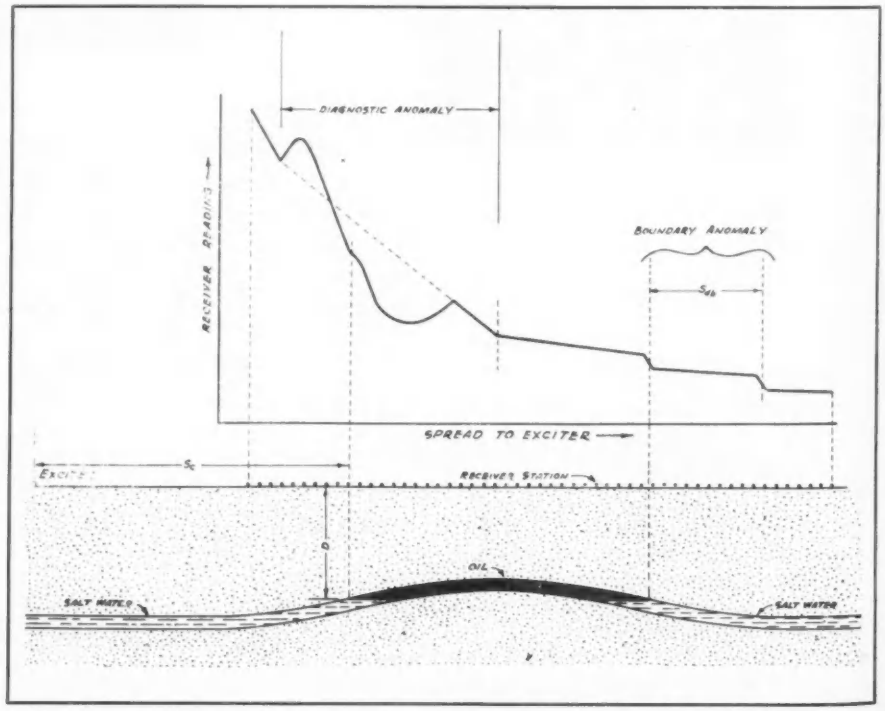

Fig. 4—Anomalous profile over an oil deposit associated with an anticlinal structure.

of an accumulation and serves as a lead for positioning the exciter to obtain a diagnostic anomaly. It should be noted that the dimensions of both the diagnostic and boundary anomalies change with the depth D of the related oil deposit, and particularly that the S_e spread and the delayed-break spread S_{db} are measures of the oil-boundary depths.

An important limitation of the method is that in order to develop a diagnostic anomaly, the width of an oil deposit must be at least 1¼ times its depth below the surface. The length of a diagnostic anomaly varies according to the depth of the oil deposit, and the above width of the oil is necessary for the anomaly to develop. It is also important to note that Radoil locates the edges of an oil accumulation; it is the contrast between the electrical properties of the oil and the surrounding water or sediment that produces the anomalies on the transmission curves. If the exciter and all the receiver stations were located over an oil deposit, no evidence of the presence of the oil would show on the transmission curve.

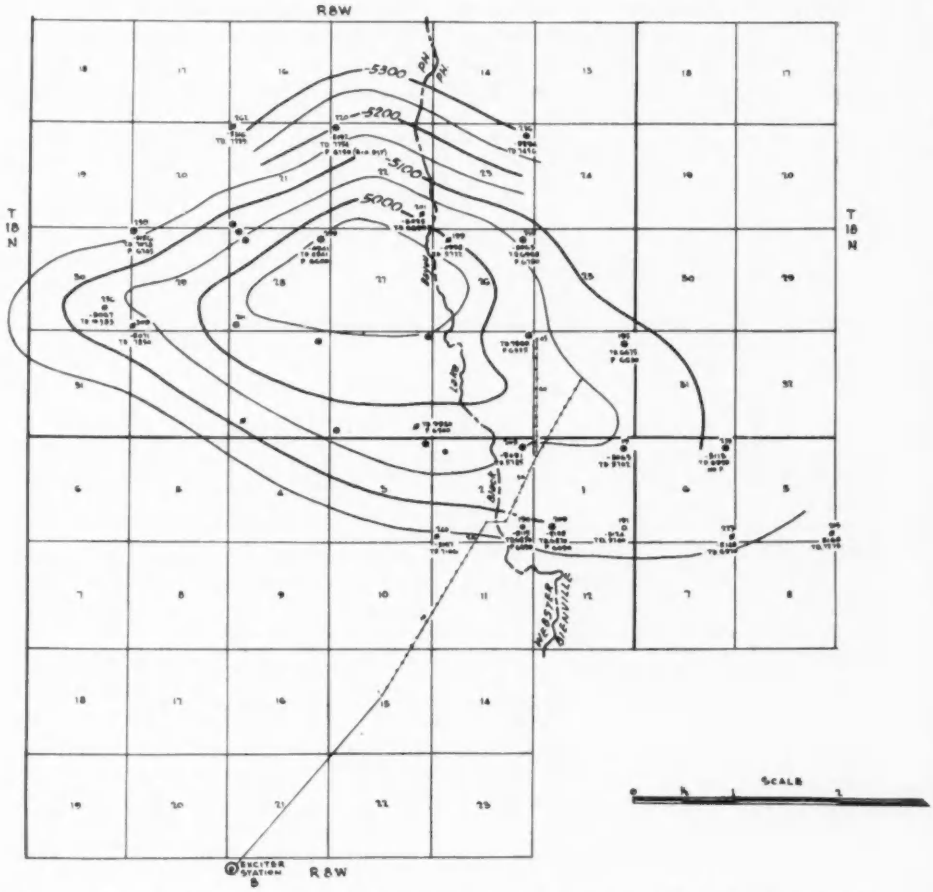

Fig. 5—Map of the Ada field of Webster and Bienville parishes of Louisiana showing structural contours on the base of the Massive Anhydrite and the location of Radoil profile.

Data Collected. Use of the new instruments for the past two years has provided considerable data. Much of this data was obtained for clients but a few experimental surveys were designed to determine whether or not it is a useful method of locating oil. Some practical examples from these experimental surveys will be presented to illustrate the operation of the method.

The first experiments were conducted over oil fields for the purpose of learning if diagnostic anomalies could be found over the edges of known oil deposits. Operating over producing oil fields is difficult because the derricks and other metal equipment on the surface tend to cause interference with the pattern of the transmission curves, and where the derricks are closely spaced, it is difficult or impossible to do good Radoil work. Furthermore, it is essential to cross the edge of an oil deposit of sufficient size before conclusive results can be expected.

One of the best diagnostic anomalies was obtained over the Ada field, Webster and Bienville parishes, Louisiana. The wells in this field were spaced at one mile intervals and no interference from derricks or oilfield equipment was noted. On the south side of the field an edge of the oil accumulation was indicated between a dry hole and a 6700-foot producer which were one mile apart, and it appeared that a diagnostic anomaly should be obtained with a minimum of work. Figure 5 shows the location of the Ada field, with contours drawn on the base of the Massive Anhydrite, according to data available in May 1951. This figure also shows the location of the exciter and receiver stations and the profile crossing over the edge of the field between the dry hole and the producer.

Figure 6 shows the transmission curve plotted from data obtained on this profile, and it is seen that these data fall into the pattern of a diagnostic anomaly as indicated by the idealized profile of Figure 4. Similar diagnostic anomalies were obtained from other exciter positions on this line but the anomaly was developed best on Profile B. The edge of the oil accumulation is indicated to be beneath Station 19, which is seen to be a reasonable location. In order to determine if this profile would repeat itself after a period of time, Profile B1 was run from the same exciter position two months after the original profile, and almost identical results were obtained.

Having determined that a diagnostic type anomaly could be developed over a deeply buried oil boundary, and that the anomaly could be verified by subsequent rechecking, it was decided to learn if a neutral profile would be obtained over an area barren of oil. For this purpose, a profile was run across an area in South Texas which was far removed from any telephone or power lines or similar interference. The surface was relatively flat and uniform in composition and covered by low brush. No evidence of oil was expected, and the expectation was verified by the neutral profile appearing in Figure 7. Further work with the method has demonstrated that this is the most common type of profile observed, and that the diagnostic profile is the most uncommon type.

Boundary Question. There remained the question of determining if a bound-

ary anomaly would appear over the edge of an oil field, and of whether or not such an anomaly would be subject to confirmation with a diagnostic anomaly. The Big Foot field of Frio County, Texas, was selected for this investigation. Oil had been discovered in this field at a depth of about 3500 feet; the field was being developed rapidly, and was believed to extend some distance to the east.

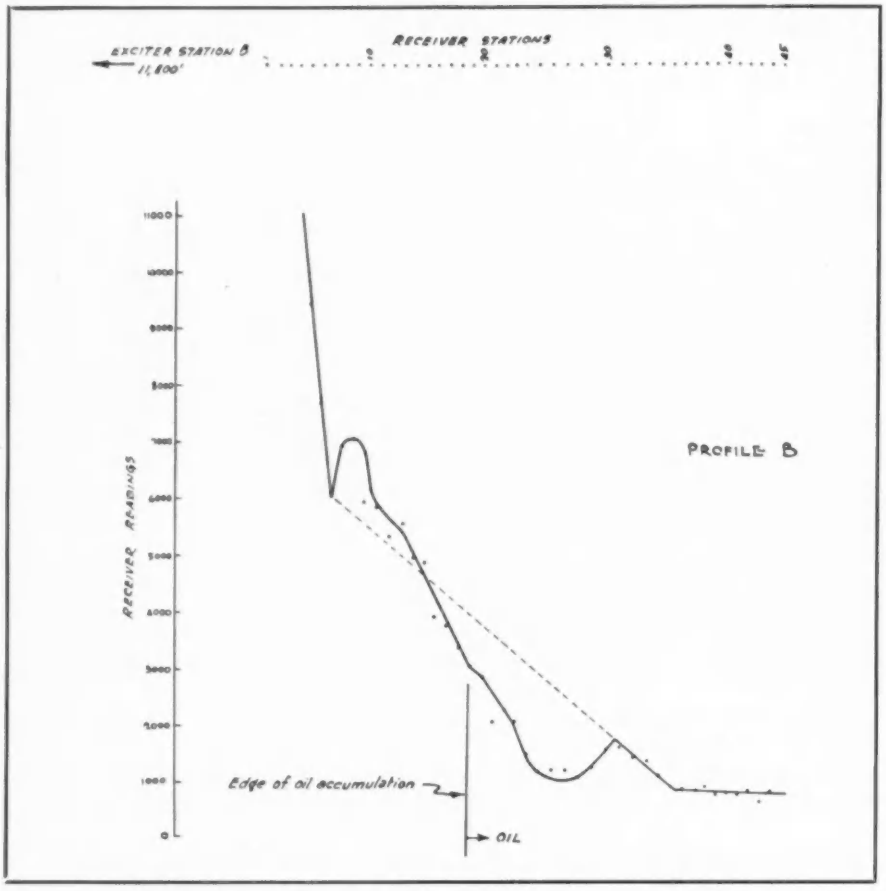

Fig. 6—Diagnostic anomaly observed over the south boundary of the Ada field of Webster and Bienville parishes of Louisiana.

Profile lines were laid out about a mile east of the nearest drilling well with a bearing of approximately north and south. Profile A was run from the south and Profile B was a reverse of the same line. The data obtained on these two profiles are shown in Figure 8. On the north end of Profile A a fairly strong boundary type break was found indicating an edge of the oil accumulation below Station 84, at a depth of about 3400 feet. This boundary break furnished a tentative location for the oil edge, and the normal procedure to check such an indication is to reverse the profile.

Accordingly, the exciter was set up at the required distance from this indicated edge for a depth of 3400 feet and the profile was run in reverse. Then according to the rules of operation, if the break at Station 84 were a valid indication of the edge of the oil accumulation, and if the width of the accumulation were at least 1¼ times its depth, it should be possible to confirm the boundary anomaly by means of a diagnostic anomaly on the reverse profile.

Inspection of Profile B shows that a diagnostic anomaly was obtained on this curve very near the location

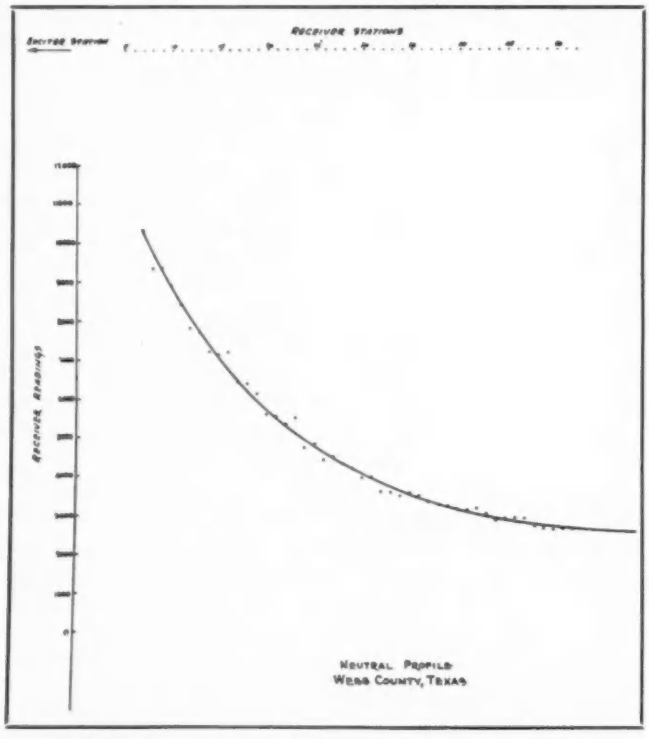

Fig. 7—Neutral profile obtained over an area barren of oil in South Texas.

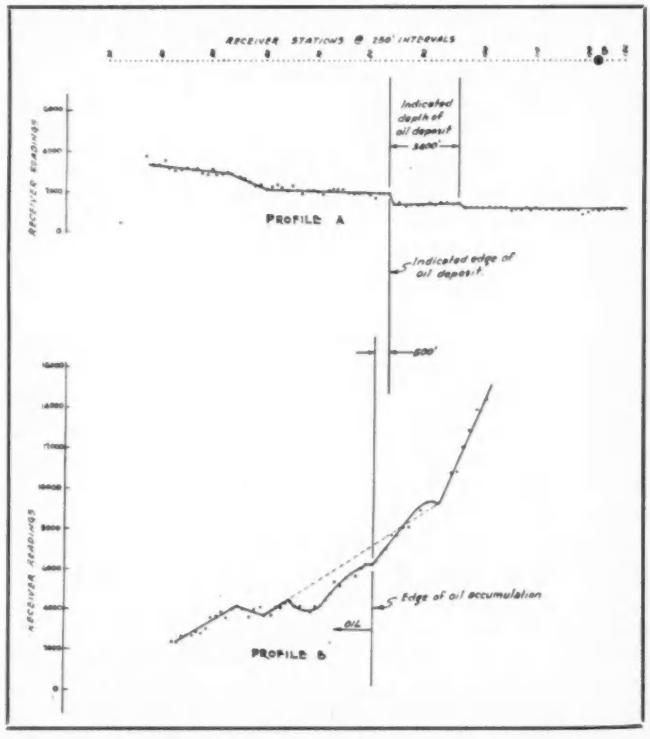

Fig. 8—Diagnostic anomaly and boundary anomaly observed over the north boundary of Big Foot field of Frio County, Texas.

indicated by the boundary anomaly. Although the quality of both the boundary anomaly and the diagnostic anomaly is only fair, the observed agreement between the two anomalies does provide evidence of their probable interrelation.

Drilling to date has not reached and defined the eastward limits of the field, nor has it reached the edge of the oil deposit as indicated by the survey. Accordingly, the accuracy of the indications has not as yet been tested by drilling, but the close correlation of the indications with the depth of the oil zone tends to support their validity.

It is worth noting that the intensity of the diagnostic anomaly observed over the Ada field is considerably larger than that of the diagnostic anomaly observed over the Big Foot field, and this may be significant in view of the fact that the potential production from the oil well checked in the Ada field was several times larger than from the average well on the east side of the Big Foot field.

In summary, the preceding examples demonstrate that a relatively smooth neutral profile was observed over an area that was believed to enclose no oil accumulation, that both diagnostic and boundary anomalies appeared over the edges of oil fields, that these anomalies seemed to bear a definite relationship to one another and that each correlated with the depth of the related oil deposit, and finally, that the intensity of a diagnostic anomaly may be related to the quality of the oil field responsible for the anomaly.

In conclusion it may be said that the results of the field experiments already conducted have been favorable, but that further field studies will be needed to fully evaluate the possibilities and limitations of the method. A thorough investigation appears justified, for once established, the method should be a useful tool in exploring for oil accumulations, especially those associated with stratigraphic traps and other types of structures that are not easily found by present methods.

—The End.

ACKNOWLEDGMENT

Thanks are due the management of Petty Geophysical Engineering Company for permission to publish this paper, and to William M. Barret, Inc., for furnishing the photographs appearing as Figures 1 and 2, and for providing the information needed in the preparation of Figures 3 and 4.

Four Miles Down... and Still Drilling

More than four miles into the California earth, The Ohio Oil Company's KCL "A" 72-4, was still drilling at last report. At 21,306 feet, this well was not only the world's deepest, but it was 785 feet deeper than the previous record-holder. Each day an additional fifteen to twenty feet are being drilled in search for the Eocene rocks beneath the Paloma field of Kern County.

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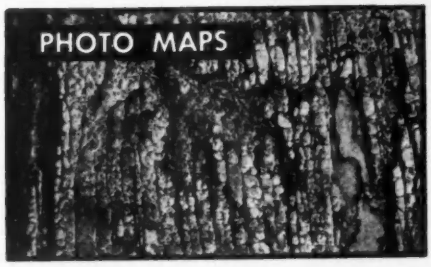

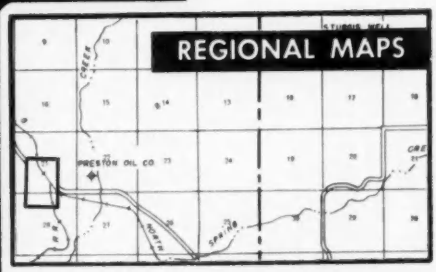

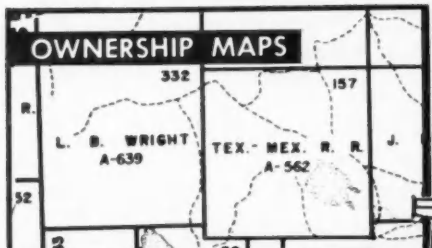

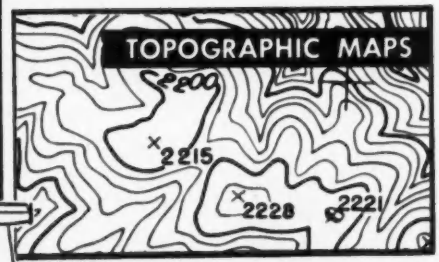

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• Exploratory Drilling . . . in September and First Nine Months, 1953-1952 . . .

State or District	MONTH OF SEPTEMBER, 1953													FIRST NINE MONTHS, 1953																
	Productive Tests									Total Productive	Unproductive Tests			Total Exploratory Tests	Productive Tests								Tot Productive		Unproductive Tests			Total Dry		Total Exploratory Tests	
	New Fields			New Pays			Extensions								New Fields			New Pays			Extensions									
	Oil	Dis.	Gas	Oil	Dis.	Gas	Oil	Dis.	Gas		Wildcats	New Pays	Outposts		Oil	Dis.	Gas	Oil	Dis.	Gas	Oil	Dis.	Gas	9 Mo. 1953	9 Mo. 1952	Wildcats	New Pays	Outposts	9 Mo. 1953	9 Mo. 1952	9 Mo. 1953	9 Mo. 1952
Alabama											7			7											2	60			60	25	60	27
Arizona																										6			6	1	6	1
Arkansas				1			1		1	3	9			12	9		1	11			3		1	25	13	89		1	90	77	115	90
California				2						2	42		2	46	12		4	21		5	15		1	58	73	324	1	28	353	308	411	381
Colorado	4	1	1							6	24			30	21	2	10	1		1	2			37	23	222			222	151	259	174
Florida											5			5												28			28	6	28	6
Georgia											1			1												5			5		5	
Idaho																										4			4		4	
Illinois	5			1			2			8	38			46	17		1	12			33			63	74	336			336	434	399	508
Indiana	5			1						6	35			41	24		2	2		1	5			34	30	272			272	263	306	283
Kansas	9		1							10	67			77	103		17	3			4		2	129	106	674			674	646	803	752
Kentucky	3									3	15			18	18		1				2			21	25	88			88	94	109	119
Louisiana	2	2	3	2	1	1	2			13	43		2	58	25	14	4	30	8	8	10	4	1	104	72	292		6	298	264	402	336
North Louisiana				1			2			3	25		1	29	5	4		5	1	1	7			23	30	147		4	151	144	174	174
South Louisiana	2	2	3	1	1	1				10	18		1	29	20	10	4	25	7	7	3	4	1	81	42	145		2	147	120	228	162
Michigan	1									1	21			22	8			4			4			16	29	184			184	178	200	207
Mississippi	1									1	9			10	8	2	3	4	1		2	1		21	16	140		6	146	123	167	139
Missouri											2			2												10			10	16	10	16
Montana	3									3	25			28	10			2			1			13	6	81			81	53	94	59
Nebraska											14			14	15			3			2		1	21	13	112		2	114	86	135	99
Nevada																										8			8		8	
New Mexico	3		13							16	13			29	17		26	1	1		5		4	54	47	105			105	88	159	135
North Carolina																										1			1		1	
North Dakota				1			1			2	11			13	7			1			3			11	9	49			49	6	60	15
Ohio									1	1				1							2		3	5	9	12			12	25	17	34
Oklahoma	17		5	5		2	7			36	53			89	91	6	20	25	1	3	51	1	5	203	150	536			536	553	739	703
Pennsylvania																							1	1						2	1	2
South Dakota																										14			14	3	14	3
Tennessee											1			1												1			1		1	
Texas	50	5	2	12	6		3	1	2	81	320		6	407	386	53	67	176	38	18	102	17	18	875	759	3094		79	3173	3067	4048	3826
Dist. 1 S. Central	2									2	23			25	13	2	3	1	2	1	1			24	26	232		7	239	246	263	272
Dist. 2 Middle Gulf	2			1			1		2	6	20		1	27	14	8	9	9	5	2	5	1	4	57	67	206		5	211	216	268	283
Dist. 3 Upper Gulf	1	3		3	2					9	29		2	40	22	12	5	35	15	7	9	10	7	122	111	269		45	314	254	436	365
Dist. 4 L. Gulf-SW	2	1	1	2	3			1		10	42			52	35	20	23	44	14	7	2	3	4	152	86	359		4	363	301	515	387
Dist. 5 E. Central					1					1	5			6	3	1	1	2	1					8	6	87			87	92	95	98
Dist. 6 Northeast	3									3	18			21	8	3		5			1			17	17	112		2	114	97	131	114
Dist. 7-B N. Cent.	18		1	3						22	69		1	92	122		16	27			20	1	1	187	154	708		2	710	703	897	857
Dist. 7-C W. Cent.	4	1								5	28			33	43	6	5	14			7			75	80	260		2	262	287	337	367
Dist. 8 West	8			2			2			12	33			45	56	1	2	14	1		24			98	91	279		2	281	306	379	397
Dist. 9 North	10			1						11	52		2	65	69		3	25		1	32	1	2	133	120	576		10	586	541	719	661
Dist. 10 Panhandle											1			1	1						1			2	1	6			6	24	8	25
Utah											2			2	3		5				1			9	1	33			33	38	42	39
West Virginia																									1				3		4
Wyoming	4		1				1			6	13			19	18		3	3			1			25	14	93			93	92	118	106
Total U.S.	107	8	26	25	7	3	17	1	4	198	770		10	978	792	77	173	290	49	36	248	23	37	1725	1472	6873	1	122	6996	6592	8721	8064

Exploratory Drilling Pace Continues High in September

By **CECIL W. SMITH,** WORLD OIL Staff

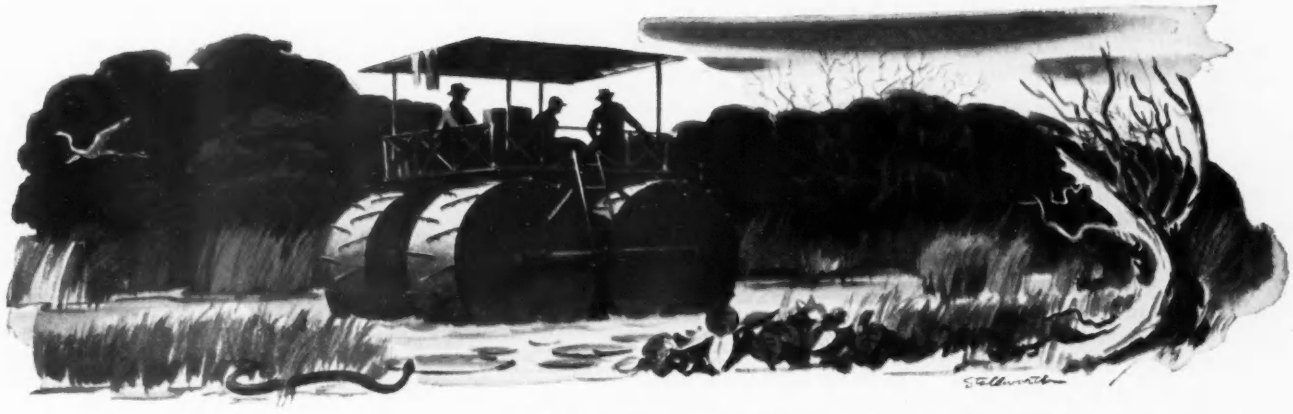
EXPLORATORY DRILLING continued through September at the same high rate that has made this year's oil-hunting campaign the most vigorous in history. September's completed tests failed to hold the 1000-mark reached in each of the past four months, but they were not far under that level and were considerably above the results in September of last year.

During the month, 978 exploratory tests were recorded as complete. That was less than the record 1063 completed in the previous month, but more than the 880 credited to last year's same period. Normally, completed wells show some drop in September from the usually high activity of August. Of course, one of the reasons is the difference in the lengths of the two periods.

By the end of this year's third quarter, exploratory tests completed numbered 8721, for a new all-time record and 8.1 percent more than the previous high of 8064 drilled in the comparable period of 1952. Not only have this year's tests been more numerous than last year's, but a larger

Summary of Results of Exploratory Drilling

ITEM	Sept., 1953	Aug., 1953	NINE MONTHS January-September 1953	1952	Percent Diff.
Oil Discoveries	**132**	**115**	**1082**	**962**	**+ 12.5**
New Fields	107	89	792	734	+ 7.9
New Pays	25	26	290	228	+ 27.2
Distillate Discoveries	**15**	**12**	**126**	**103**	**+ 22.3**
New Fileds	8	4	77	90	— 14.5
New Pays	7	8	49	13	+276.9
Gas Discoveries	**29**	**23**	**209**	**146**	**+ 43.2**
New Fields	26	18	173	118	+ 46.6
New Pays	3	5	36	28	+ 28.6
Total Discoveries	**176**	**150**	**1417**	**1211**	**+ 17.0**
Extensions to Fields	**22**	**42**	**308**	**261**	**+ 18.0**
Oil Fields	17	32	248	222	+ 11.7
Distillate Fields	1	2	23	6	+283.3
Gas Fields	4	8	37	33	+ 12.1
Total Prod. Tests	**198**	**192**	**1725**	**1472**	**+ 17.2**
Dry Holes	**780**	**871**	**6996**	**6592**	**+ 6.1**
Wildcats	770	859	6873	6380	+ 7.7
New Pays			1	11	— 90.9
Outposts	10	11	122	201	— 39.3
Total Expl'tory Tests	**978**	**1063**	**8721**	**8064**	**+ 8.1**
Percent Productive	20.2	18.1	19.8	18.3	
Percent Dry	79.8	81.9	80.2	81.7	



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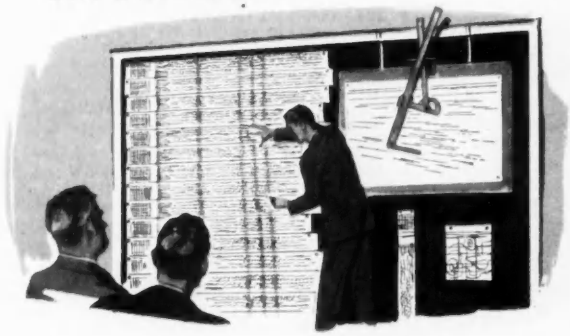

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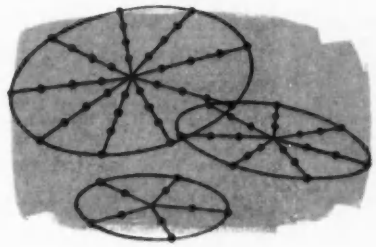

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part of them were completed successfully.

To date, 1725 tests proved productive and they amounted to 19.8 percent of the total completed. A year earlier, 1472 successes were only 18.3 percent of the total.

Resulting from this year's efforts were the 1082 new oil pools opened. By the same time last year the count had been only 962 new oil pools discovered. Distillate discoveries showed a similar increase, being 126 pools to 103. Percentage-wise, gas discoveries topped all others. In nine months, the nation's drillers found 207 new gas pools, while the score a year before had been 146 finds.

Although exploration in the nation as a whole has been successful in 19.8 percent of the wells, the individual areas varied greatly from that overall average. Texas, the largest drilling state, was near the U. S. average, as it could be expected to be on account of its large part of the total. In nine months, there were 4048 exploratory wells completed in Texas and 875 proved to be commercial producers. That amounted to a score of 21.6 percent.

Kansas, the number two exploratory drilling state this year, completed 803 tests of which 16.1 percent or 129 wells were successes. In third place was Oklahoma with 739 tests. Those efforts were rewarded with 203 producers and they amounted to an impressive 27.5 percent of the total drilled.

Fourth place in the exploration picture belonged to California and in that state 411 tests have been completed so far this year. Results in that sector were, by U. S. average standards, a disappointing 58 successful tests or only 14.1 percent of all wells.

One of the better records among the first five exploratory drilling states occurred in Louisiana. That state boasted of 104 finds in 402 attempts, and that calculated to be 25.9 percent successful.

U. S. Discoveries in September

NEW FIELDS, NEW PAYS AND EXTENSIONS

COUNTY	FIELD	COMPANY, WELL AND LOCATION	Date Completed	Total Depth (Feet)	Completion Horizon (Feet)	[1]Name, Character and Age of Producing Formation	[2]Initial Production Method and Choke	Gravity of Oil
		ARKANSAS—NEW OIL PAY						
Nevada	Falcon	H. M. Mills' Mrs. E. W. Russell et al 1, C SE NW NW 8-18s-22w	9- 5-53	3508	2636- 2652	Tokio sd; U. Cre.	P 720	26.4
		ARKANSAS—OIL FIELD EXTENSION						
Union	Lisbon, East	Curtis Kinard's Brewster 1, C NW NE 23-17s-16w, ¾ mi se ext	9- 4-53	6838	6733- 6738	Smackover li; Jur.	F 244; 13/64"	37.4
		ARKANSAS—GAS FIELD EXTENSION						
Miller	Ft. Lynn	McAlester Fuel Co.'s W. W. Thornton Est. A-1, C SE NW 30-18s-27w, 1⅝ mi sw ext.	9- 9-53	6972	6154- 6340	Rodessa li; L. Cre.	F 20 dist; 1.5 mln; 7/64	60
		CALIFORNIA—NEW OIL PAYS						
Kern	Tunis Creek	D. K. Partnership's Corral 355-28, in 28-11n-18w	9-28-53	1890	1284- 1337	Tecuya sd	F 50	32
Los Angeles	Whittier	Standard Oil Co.'s Central Fee 77, in 23-2s-11w	9-22-53	5976	4655- 5055		P 200	....
		COLORADO—NEW OIL FIELDS						
Adams		Denver Basin Oil Co.'s Hough 1, SW SW SE 2-1s-57w	9-11-53	5587	5356- 5362	"D" sd; U. Cre.	P 135	....
Adams		Sinclair O&G Co.'s John J. Shea 2, NE NE SW 14-2s-57w	9-30-53	5409	5268- 5280	"D" sd; U. Cre.	S 240	....
Logan		Lowell & Daniels' Bonham C-12-1, SW NE SE 27-8n-55w	9- 1—53	5433	5391- 5405	"J" sd; U. Cre.	F 576	....
Moffat	Temple Canyon	Anderson-Prichard Oil Corp.'s Government 1-A, SE SE NE 17-4n-95w	9- 9-53	6374	6000- 6008	Morrison sd; Jur.	F 173	35
		COLORADO—NEW DISTILLATE FIELD						
Morgan		Falcon-Seaboard's Scritsmeir 1, NW NE NE 19-1n-57w	9-30-53	5714	5636- 5640	"J" sd; U. Cre.	F dist; 7.0. mln; open	....
		COLORADO—NEW GAS FIELD						
Sedgwick		Stanolind O&G Co.'s Donaldson 1, SE NE 26-10n-47w	9- 8-53	4065	3840- 3845	Upper Muddy sd; U. Cre.	F 2.5 mln; open	....
		ILLINOIS—NEW OIL FIELDS						
Clark	Melrose, South	J. W. Lewis-D. Dewey's H. Atkins 1, NE NE NW 25-9n-13w	9-29-53	880	865- 872	Pennsylvanian sd; Penn.	P 5; 2 wtr;	....
Gallatin	Junction, East	W. C. McBride & D. Miller Drlg. Co.'s M. M. Crane 1, NW NE NW 1-9s-9e	9-29-53	2890	2000- 2013	Waltersburg sd; Miss.	P 34; 4 wtr	....
Macon	Decatur	Harmon Oil Co.'s Trump 1, NE SE NE 5-16n-2e	9- 8-53	2052	2010- 2047	Silurian dolo; Sil.	P 13; 12 wtr	....
Washington	Ashley	Ohio Oil Co.'s F. Sawyer's 1, SE SW NW 33-2s-1w	9-22-53	3116	1429- 1440	Bethel sd; Miss.	P 15; 7 wtr	....
Wayne	Calhoun, South	Collins Bros.' Patton Est. 1, NE NE SW 36-2n-9e	9-29-53	3350	3130- 3188	Aux Vasis sd; Miss.	P 50; 20 wtr	....
		ILLINOIS—NEW OIL PAY						
White	Centerville	Q. B. Mitchell's Williams Heirs 1, NE NW SW 1-4s-9e	9- 8-53	3410	3240- 3267	Aux Vases sd; Miss.	P 56	....
		ILLINOIS—OIL FIELD EXTENSIONS						
Clay	Sailor Springs, Cons.	Magnolia Pet. Co.'s W. G. King 1, SE NW NE 22-3n-7e, ½ mi ext.	9-15-53	2981	2969-2976	Rosiclare li; Miss.	P 66	....
Hamilton	Rural Hill, West	C. E. Brehm's S. McFarland 1, NW NW NW 4-7s-5e, ¾ mi sw ext	9-15-53	3226	3206- 3220	Aux Vases sd; Miss.	P 120; 40 wtr	....
		INDIANA—NEW OIL FIELDS						
Gibson	Francisco, W.	J. L. Black's W. E. Hollingsworth 1, SE NW SE 13-2s-10w, ½ mi s ext	9- -53	1408	1390- 1408	Cypress sd; Miss.	P 90	....
Gibson	Ft. Branch, W.	Ervin Drilling Co.'s W. M. Hofman 1, NW NE SE 7-3s-10w	9- -53	1353	1342- 1352	Biehl sd; Miss.	P 5	....
Posey	Savah, West	Peter Fox Brewing Co.'s Herdis Clements 1, NW NW NW 10-6s-14w	9- -53	3054	2236- 2242	Tar Springs sd; Miss.	P 48	....
Spencer	Liberal	Walter Sargent's Oliver Criss 1, NW NW NE 27-5s-5w	9- -53	854	845- 851	Jackson sd; Miss.	P 25; 10 wtr	....
Sullivan		H. A. Johnson's Bessie Riggs 1, SE SE SW 36-8n-11w	9- -53	785	738- 754	Mansfield sd; Penn.	P 20	....
		INDIANA—NEW OIL PAY						
Spencer	Troy	C. A. Busick's Marie Berg's 1, NE SE NW 11-6s-4w	9- -53	1533	1530- 1533	Salem li; Miss.	P 75	....
		KANSAS—NEW OIL FIELDS						
Barton		Schermerhorn Oil Co.'s Merten 1, NW NE SE 35-19s-15w	9- -53	3541	3291- 3295	Lansing li; Penn.	P 13	....
Butler		Stelbar Oil Co.'s Stolebarger 1, N½ N½ NW 36-29s-4e	9- -53	2774	2757- 2774	Bartlesville sd; Penn.	P 20	....
Ellis	Leiker, East	Don Pratt's Brock 1, SW SW SW 12-15s-18w	9- -53	3590	3576- 3589	Arbuckle li; Ord.	P 170	....
Ellis		Carl Lebsack's Dreiling 1, SE SE NW 21-12s-17w	9- -53	3700	3540- 3546	Lansing li; Penn.	P 230	....
Ellis		Carl Tood Drilling Co.'s Egger 1, SW SW SW 6-13s-20w	9- -53	3838	3830- 3838	Arbuckle li; Ord.	P 25	....
Graham	Diebolt	Imperial Drilling's Diebolt 1, NW NE SE 33-10s-23w	9- -53	3785	3779- 3785	Lansing li; Penn.	P 505	....
Graham	Noah, East	Appelman & Trans-Era's Holzhuer 1-A, SW SW NW 26-10s-21w	9- -53	3707	3705- 3707	Arbuckle li; Ord.	P 132	....
Rice	Green	Graham-Messman-Rinehart Oil Co.'s Green 1, NW NE SE 14-19s-6w	9- -53	3404	3380- 3404	Mississippi li; Miss.	P 24	....
Sumner		Orville Parker's Hansen 1, SE SE SE 26-34s-2e	9- -53	3525	3498- 3502	Bartlesville sd; Penn.	P 10	....
		KANSAS—NEW GAS FIELD						
Barton	Converse	Sunray & Stickle Drlg. Co.'s Converse 1, NW NE SW 20-20s-15w	9- -53	3874	3784- 3829	Arbuckle li; Ord.	F. 3.8 mln	....
		KENTUCKY—NEW OIL FIELDS						
Henderson	Anthoston	Ryan Oil's Virginia Crafton 2, SE SE NW 9-9-24	9- -53	2051	2044- 2051	Jackson sd; Miss.	P 33	....
Union		J. P. Washburn & R. O. Wilson's A. G. Mason 1, in 17-P-20	9- -53	2600	2450- 2460	Rosiclare li; Miss.	P 110	....
Union		J. P. Washburn & R. O. Wilson's G. F. Clements 1, in 15-P-20	9- -53	1760	762- 778	Pennsylvania sd; penn.	P 25	....
		NORTH LOUISIANA—NEW OIL PAY						
Concordia	Wildsville	E. C. Wentworth & Barnett Serio Drlg. Co.'s Wilds A-1, in 18-7n-7e	9-22-53	5150	4830- 4833	Wilcox sd; Eoc.	F 83; 7/64"	....

Check List of Uses for
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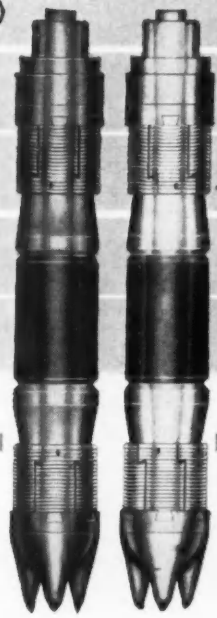
WIRE-LINE DRILLABLE
BRIDGING PLUGS

JOB TO BE DONE	PLUG FOR THE JOB
Testing Multiple Zones	Magnesium—for fastest possible drillout—1 to 3 hours
Upper Zone Testing & Completion	Magnesium or Cast Iron
False Bottom	Cast Iron, usually
Nitro Tamping	Magnesium or Cast Iron
Squeeze Operations	Cast Iron, in view of the higher pressures
Casing Recovery	Magnesium or Cast Iron
Abandonment	Cast Iron—it will outlast the casing



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AU-605

COUNTY	FIELD	COMPANY, WELL AND LOCATION	Date Completed	Total Depth (Feet)	Completion Horizon (Feet)	[1]Name, Character and Age of Producing Formation	[2]Initial Production Method and Choke	Gravity of Oil
		NORTH LOUISIANA—OIL FIELD EXTENSIONS						
Caddo	Pine Island	Pan-Am Southern Corp.'s C. T. Lay 1, in 6-21n-14w, ½ mi ne ext	9-18-53	1716	1571- 1645	Chalk; U. Cre.	P 28	....
Caddo	Pine Island	Stanolind O&G Co.'s Reuben T. Douglas 1, C NE NE NW 17-21n-14w, 1 mi n ext.	9-14-53	1690	1549- 1673	Chalk; U. Cre.	P 18	....
		SOUTH LOUISIANA—NEW OIL FIELDS						
Jefferson Davis		H. L. Hunt's Lock-Moore Co.'s 1, in 34-7s-6w	9-19-53	9500	9298- 9314		F 252; 8/64"	36.5
Lafourche	Cut off area	The California Co. & Superior Oil's Clovelly 1, in 44-18s-21e	9-14-53	12615	11534-11543		F 308; 9/64"	33.1
		SOUTH LOUISIANA—NEW OIL PAY						
Cameron	Big Lake	Kerr-McGee Oil Ind., Inc.'s Le Bleu et al 1, in 12-12s-9w	9-30-53	13073	10334-10346		F 348; ½"	34.3
		SOUTH LOUISIANA—NEW DISTILLATE FIELDS						
Acadia	N. Eagan area	Sun Oil Co.'s Acadia Parish School Board 1, in 16-9s-2w	7-30-53	12500	11532-11552		F 56 dist; 1.9 mln; ½"	50.8
St. Mary	Franklin	Southern Natural Gas Co.'s Gas Unit 1-1, in 37-15s-9e	9-16-53	12726	11071-11081		F 350 dist; 7.0 mln; ¼"	48
		SOUTH LOUISIANA—NEW DISTILLATE PAY						
St. Landry	Cankton	Bates & Cornell's Begnaud et al 1, in 25-8s-3e	9-30-53	10662	10384-10394		F 58; 1.5 mln; 12/64"	50
		SOUTH LOUISIANA—NEW GAS FIELDS						
Cameron	Deep Lake	The Superior Oil Co.'s Rockefeller St. Lse. 2038-3, in 4-16s-3w	9- 2-53	13100			Ungauged	....
Plaquemines	Breton Sound area	Kerr McGee's State Lease 1219-1-A, Blk 18	9-20-53	8382	397- 404	"G" sd	Ungauged	....
St. Bernard	Main Pass Blk 1 area	O'Meara Bros.'s State Lease 2192-1, in 16s-17e	9-16-53	10015	8401- 8406		F 1.5 mln; 1/8"	....
		SOUTH LOUISIANA—NEW GAS PAY						
Calcasieu	North Starks	Sun's Lutcher-Moore 7, in 2-8s-13w	9- 7-53	9753	8670- 8710		Ungauged	....
		MICHIGAN—NEW OIL FIELD						
Allegan		R. D. Evans & Sons' Garlock 1, NE NE NW 2-2n-13w, Allegan Township	9- -53	1557	1550- 1557	Traverse li; Dev.	P 10	....
		MISSISSIPPI—NEW OIL FIELD						
Jefferson		Humble's H. A. Phillips et al 1, in 6-10n-2w	9-25-53	9524	9160- 9172	L. Tuscaloosa sd; U. Cre.	F 28; ¼"	....
		MONTANA—NEW OIL FIELDS						
Musselshell	Devils Basin area	Farmers Union Central Exchange's NPRR 2, NE NW SW 5-10n-25e	9- 1-53	2230	2176- 2185	Heath li; Miss.	P 12	35
Musselshell	Ivanhoe Dome area	Chicago Corp. & Republic Nat. Gas Co.'s NPRR 1, SW SE NE 17-11n-31e	8- 1-53	5208	2798- 2805	Morrison sd; Jur.	P 92	....
Roosevelt		Empire State Oil Co.'s Smith 1, C SW SE 8-29n-51e	6-15-53	5979	5750- 5757	"B-1" sd; Miss.	F 3648; open	....
		NEW MEXICO (PERMIAN BASIN)—NEW OIL FIELDS				"B-2" sd; Miss.	F 2569; open	41.6
Lea		Continental Oil Co.'s State "Q-15" 1, in 15-16s-32e	8-26-53	13689	9449- 9469	Wolfcamp li; Perm.	F 501; 5/8"	37.6
Lea		The Texas Co.'s C. H. Weir B-1, in 11-20s-37e, OWDD	9-28-53	9671	6856- 6896	Drinkard sd; Perm.	F 265; 39/64"	32.6
Lea		Western Natural Gas Co.'s Millard Eidson 1, in 35-16s-35e	9-26-53	12757	12482-12680	Devonian	F 840; ½"	60
		NEW MEXICO (PERMIAN BASIN)—NEW GAS FIELD						
Lea		Morris R. Antwell's Stanolind-Federal 1, in 35-20s-37e	9-24-53	3660	3540- 3660	Queen sd; Perm.	F 6.5 mln; 1½"	....
		NEW MEXICO (SAN JUAN BASIN)—NEW GAS FIELDS						
Rio Arriba		Delhi Oil Corp.-Atlantic Refining Co.'s Jicarilla 1, NE SW SW 19-26n-5w	9-11-53	3194	3100- 3194	Pictured Cliffs sd; U. Cre.	F 1.5 mln	....
Rio Arriba		El Paso Nat. Gas Co.'s San Juan 27-4 Unit 1, SE NW SW 1-27n-4w	9-24-53	6353		Mesaverde sd; U. Cre.	F 1.5 mln	....
Rio Arriba		El Paso Nat. Gas Co.'s San Juan 28-5 Unit 1, NE SW NE 29-28n-5w	9-24-53	5938		Mesaverde sd; U. Cre.	F 2.3 mln	....
Rio Arriba		El Paso Nat. Gas Co.'s San Juan 29-4 Unit 1, SW NE SW 30-29n-4w	9-16-53	6775	6133- 6775	Mesaverde sd; U. Cre.	F 0.4 mln	....
Rio Arriba		El Paso Nat. Gas Co.'s San Juan 27-5 Unit 3, NE SW SW 17-27n-5w	9-18-53	5474	4844- 5474	Cliffhouse sd; U. Cre.	F 1.2 mln	....
Rio Arriba		El Paso Nat. Gas Co.'s San Juan 30-4 Unit 3, NW SE NW 29-30n-4w	9-16-53	4100	4035- 4100	Fruitland; U. Cre.	F 0.4 mln	....
Rio Arriba		El Paso Nat. Gas Co.'s San Juan 27-5 Unit 4, SW NE NE 29-27n-5w	9-29-53	5498		Mesaverde sd; U. Cre.	F 1.8 mln	....
Rio Arriba		Phillips Petroleum Co.'s Mesa Unit (3-25) 29-6, SE NW SW 25-29n-6w	8-30-53	5710		Mesaverde sd; U. Cre.	F 2.3 mln	....
Rio Arriba		Skelly Oil Co.'s J. F. Hickman 1, NE SW NE 17-28n-6w	9- 1-53	5930		Mesaverde sd; U. Cre.	F 4.6 mln	....
San Juan		Beaver Lodge Oil Co.'s Boyd Unit 1, NE SW SW 8-31n-10w	9-25-53	5025		Mesaverde sd; U. Cre.	F 5.5 mln	....
San Juan		Joe Lilly's Riddle 1, SW SW 7-27n-12w	9-12-53	5912	5145- 5147	Tocito sd; U. Cre.	F 0.6 mln	....
San Juan		Stanolind O&G Co.'s Huerfano Unit 23, NW SE NE 19-26n-9w	9-11-53	2015	1956- 2015	Pictured Cliffs sd; U. Cre.	F 0.1 mln	....
		NORTH DAKOTA—NEW OIL PAY						
Billings	Fryburg	Amerada Pet. Corp.'s Herman May 1, C NW NE 9-139n-100w	9-24-53	13325	9403- 9430	Madison li; Miss.	F 217; 18/64"	40.6
		NORTH DAKOTA—OIL FIELD EXTENSION						
McKenzie	Charlson	The Texas Co.'s Government 1, C SE SW 8-153n-95w, 1 mi nw ext	9-29-53	8938	8791- 8868	Mission Canyon li; Miss.	F 320; 10 wtr 12/64"	41
		OHIO—GAS FIELD EXTENSION						
Coshocton	Mt. Vernon	B. G. Davis et al's Clyde Wallick 1, Jackson Twp.	9- 2-53	4001	3859- 3864	Clinton sd; Sil.	F 0.3 mln	....
		OKLAHOMA—NEW OIL FIELDS						
Cleveland	East Noble	The Pure Oil Co.'s C. E. Hobaugh 1, SE SW SW 30-8n-1w	9-17-53	8618	7893- 7959	Tulip Creek sd; Ord.	F 441; 14/64"	35.6
Creek		Grant H. Bagley & R. P. Goldswarthy's Baker 1, SE NE NE 6-18n-8e	9- 53	2701	2546- 2556	Skinner sd; Penn.	F 3; 70 wtr; ¾"	....
Garfield		Delaney Drlg. Co.'s Burl Cline 1, SE SW NE 22-20n-4w	9- -53	6296	4622- 4626	L. Layton sd; Penn.	F 26; ½"	40
Garvin		Superior's Reeves 1, C SE SW 21-4n-4w	9- -53	9716	8286- 8411	Hart sd; Penn.	F 7; 2/64"	44
Grant	North Jarvis	Union Oil & Sun's Simpson 1, NE NE SE 29-29n-6w	9- -53	5276	5263- 5276	1st Simpson sd; Ord.	F 310; ½"	44.6
Kay		Kirkpatrick Drlg. Co.'s Walleen 1, SW NW SW 14-29n-1e	9- -53	3533	3152- 3167	Cleveland sd; Penn.	F 55; ½"	....
Lincoln		Texas Co.'s F. Frost 2, SW NW NW 18-12n-3e	9- -53	5580	5472- 5498	Simpson dolo; Ord.	P 71	36
Murray		C. E. Moore & E. T. Fairman's R. Cozad 1, C NW SW 21-2n-3e	9- -53	980	830- 837		P 4	19
Noble		Pace Pet. Co. Inc.'s Roscoe Marshall 1, NE NE NE 9-21-2w, OWWO	9- -53	5271	1875- 1883	Reagan sd; Perm.	P 93	....
Okfuskee		Jones-Shelburne Co.'s Alford 1, NW SE SE 32-11n-11e	9- -53	3905	3868- 3883	1st Wilcox sd; Ord.	P 20; 30 wtr	38.9
Okmulgee		J. C. Starr, W. H. Flanaghan et al's Ben Furr 1, NE NE SW 21-11n-12e	9- -53	2576	2392- 2423	2nd Gilcrease sd; Penn.	P 40; 20 wtr	37
Osage		Waite Drilling Co.'s Osage 1, SW SW NE 17-20n-11e	9- -53	2600	2181- 2191	Burgess sd; Penn.	P 6; 1½ wtr	....
					2195- 2199	Miss. sd; Miss.		
Payne		Davon Oil & Gas Co.'s Bode 1, NW SW NW 14-19n-1w	9- -53	5083	4964- 4976	1st Wilcox sd; Ord.	F 72; 11/64"	40
Pontotoc		John H. Stapleton's Norris-Law 1, SE SE NE 11-4n-4e	9- -53	2299	1710- 1725	Penn. sd; Penn.	P 5; 7 wtr	40
Pottawatomie		Viersen & Cochran's Johnson 1, NE SE NW 2-8n-2e	9- -53	5773	4883- 4895	Hunton li; Dev.	F 31; 24 wtr	33
Seminole		The Texas Co.'s W. S. Dameron 1, NW NW NE 14-5n-5e	9- -53	3185	2702- 2712	Hunton li; Dev.	F 200; 1/8"	35
Stephens		Carl Carter's Henry Pruitt 1, SE SW SW 33-2s-5w	9- -53	1300	1080- 1092		P 12	23
					1132- 1145			
		OKLAHOMA—NEW OIL PAYS						
Carter	Caddo	Beach & Talbot's Dauel 1, SE NE NW 27-3s-1e	9- -53	4832	4754- 4832	Hart sd; Penn.	F 125; 49/64"	40
Coal	Centrahoma	Twin Oil Corp. & Avila Oil Corp's R. D. Cody 1, C SW SW 27-2n-9e	9- -53	7003	6882- 6892	Oil Creek sd; Ord.	F 347; 9/32"	....
Logan	Coyle	British American's John S. Hughes 1, NW SW SW 24-17n-1e	9- -53	5176	4725- 4735	Hunton li; Dev.	F 189; ¼"	....
Logan	Edmond, W.	Powel Briscoe's Ploeger 2, NW NW NW 27-15n-4w	9- -53	6383	5450- 5502	L. Hogshooter sd; Penn.	P 140; 30 wtr	42
Osage	Naval Reserve, South	Norbla Oil's Osage 1, NW NW NW 15-23n-7e, OWWO, ½ mi e of prodn	9- -53	3070	2454- 2462	Skinner sd; Penn.	F 10; 9/16"	40
		OKLAHOMA—OIL FIELD EXTENSIONS						
Carter	Brock, West	Edwin L. Cox's Moreland 1, SE NW SW 13-5s-1w	9- 53-	4523	4198- 4208	Lone Grove sd; Penn.	F 116; ½"	37
Garvin	Erin Springs	Superior Oil Co.'s Wood 1, C SW SW 22-4n-4w	9- -53	8890	8246- 8278	Hart sd; Penn.	F 66; 12/64"	33
					8766- 8799	Springer sd; Penn.	F 235; 12/64"	38.5
Garvin	Erin Springs, S.E.	Magnolia Pet. Co.'s Pratt Est. 1, C SW SE 31-4n-3w	9- -53	8597	8058- 8072	Hart sd; Penn.	F 413; ½"	68
Lincoln	Jones	Ashland O&R Co.'s J. W. Weidner 1, SW SW SE 29-13n-2e	9- -53	5051	5027- 5031	L. Skinner sd; Penn.	P 81	38
Lincoln	Payson	Sterling Oil of Okla, Inc.'s Burchett 1, SW NW SE 8-12n-5e	9- -53	4468	4225- 4238	Skinner sd; Penn.	P 115	38
Logan	Langston	Puckett Drlg. Co.'s McDonald 1, SW SW NW 15-17n-1w	9- -53	4941	4911- 4941	L. Skinner sd; Penn.	F 204	....
Okfuskee	Morse Dist	Richard King, Jr.'s Admire A-1, SW NW SW 24-12n-9e	9- -53	2842	2804- 2826	Booch sd; Penn.	P 100	31
		OKLAHOMA—NEW GAS FIELDS						
Creek		Roy G. Woods' Dumas 1, NW SE SE 31-14n-9e	9- -53	3996	1124- 1134	Layton sd; Penn.	F 1.0 mln	....
Kay		The Texas Co.'s J. D. Charles, Jr. 1, SE NE NW 25-14n-4e	9- -53	4381	2924- 2929	Cleveland sd; Penn.	F 11.3 mln	....
Kay		W. B. Cleary, Inc.'s McKee 1, in 20-28n-1w, OWWO	9- -53	3721	3474- 3484	Wilcox sd; Ord.	F 8.4 mln	....
Noble		Midstates Oil Corp.'s Mergan 1, SE SW NW 30-24n-1w	9- -53	4150	4106- 4142	Skinner sd; Penn.	F 13.0 mln	....
Noble		Northern Plains Pet. Co.'s Murray 1, SE NW NE 25-24n-2w	9- -53	4345	4164- 4184	Skinner sd; Penn.	F 7.9 mln	....
		OKLAHOMA—NEW GAS PAYS						
Pontotoc	Jessee	Jernigan & Morgan's Simpson 1, SE SW NE 12-1n-7e	9- -53	2012	1560- 1595	Gilcrease sd; Penn.	F 7.5 mln	....
Pottawatomie	Centerpoint	Powel Briscoe, Inc.'s Myrl Drundege 1, SE SW NE 12-9n-2e	9- -53	5110	4986- 5030	Earlsboro sd; Penn.	G 1.3 mln	....

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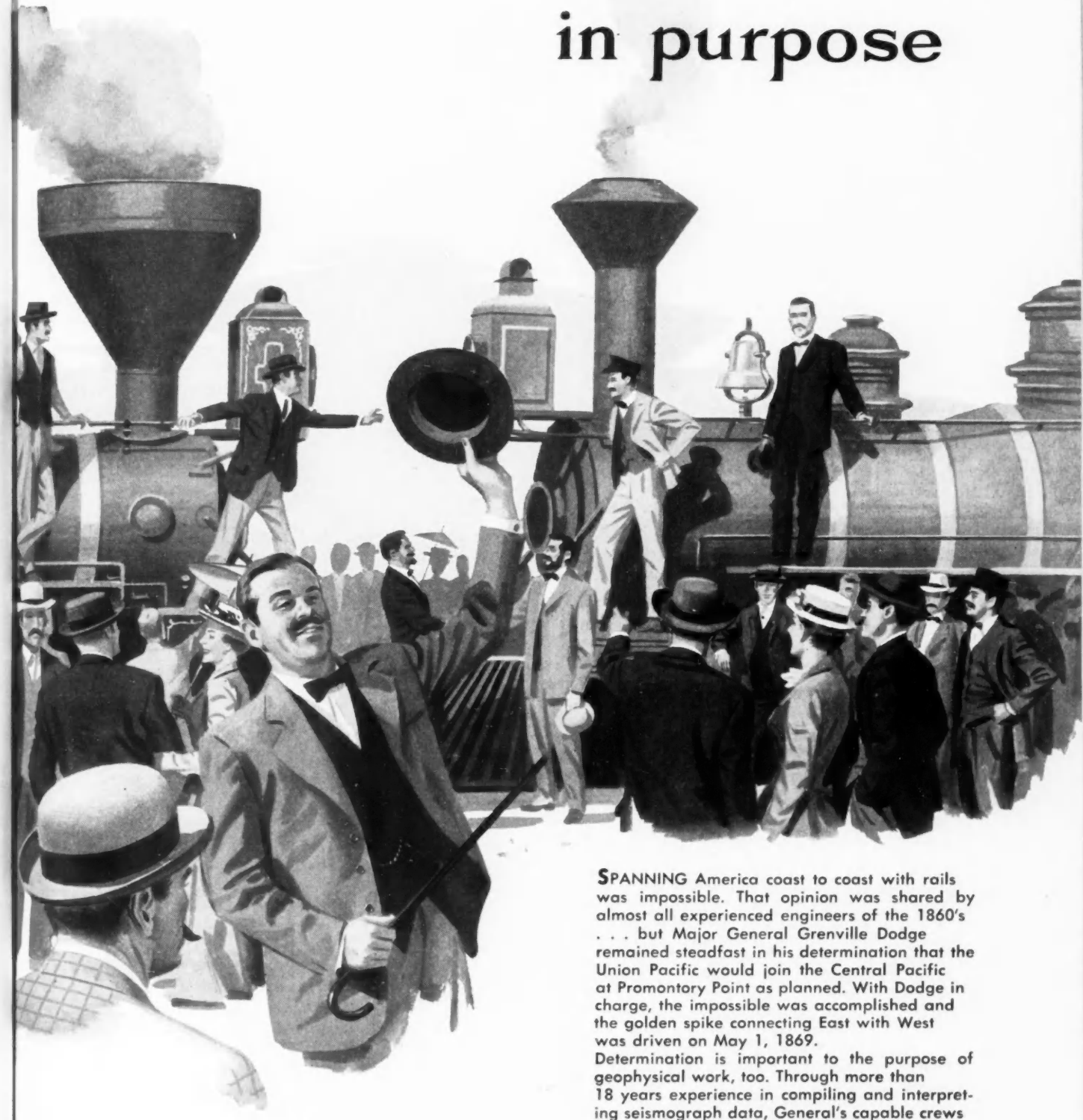

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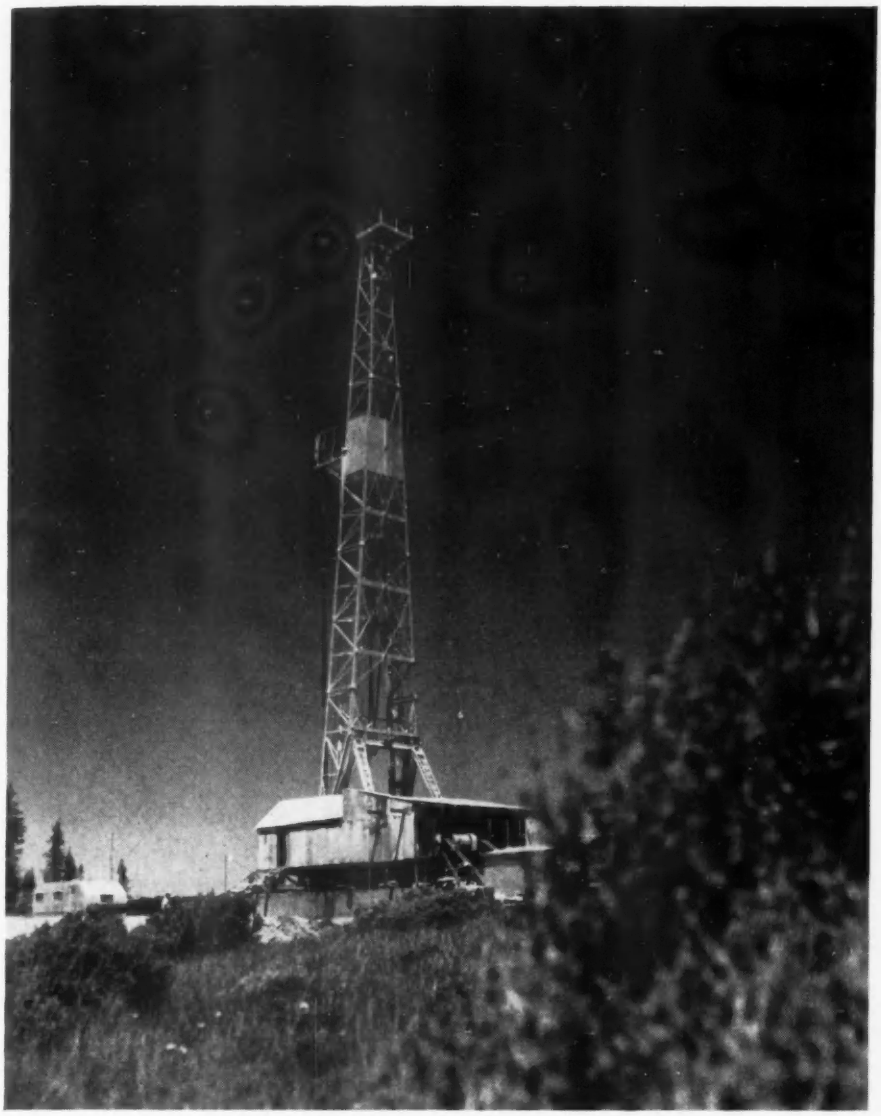
U. S. Discoveries—Continued

COUNTY	FIELD	COMPANY, WELL AND LOCATION	Date Completed	Total Depth (Feet)	Completion Horizon (Feet)	[1]Name, Character and Age of Producing Formation	[2]Initial Production Method and Choke	Gravity of Oil
		TEXAS DISTRICT 1—NEW OIL FIELDS						
Frio		Drilling & Exploration Co.'s Janie R. Foster 1, John A. Pranglin Sur. 1380	8-27-53	3482	3431- 3432 3448- 3462	Olmos 3-D sd; U. Cre.	F 46	38.6
Medina		Beckman Inc.'s S. H. Ruskin et al 1, Smith Noel Sur 42, Paten' 117, Vol. 25	7-25-53	2125	2080- 2125		P 12	44
		TEXAS DISTRICT 2—NEW OIL FIELDS						
Live Oak	Cadiz	J. B. Vassey's Mrs. J. L. Renfro 1, B. B. Atkins Sur. No. 2, A-731	9- 3-53	3503	3409- 3422	L. Hockley sd; Eoc.	F 16	28
Refurio	Mary Ellen O'Connor	Humble's Ellen O'Connor B-1, BBB&GGG Co. 13	9-18-53	6000	5866- 5876		F 123; 1/8"	36.7
		TEXAS DISTRICT 2 NEW OIL PAY						
Goliad	Barvo	Hawn Bros. Heard & Haring's A. H. Ehlers 1, Ramon Musquiz Sur.	9-17-53	4395	4151- 4161	Yegua sd; Eoc.	F 80	....
		TEXAS DISTRICT 2—OIL FIELD EXTENSION						
Refugio	Melon Creek, West	The Chicago Corp.'s Lawrence W. O'Connor Est 1, Hrs of Geo. Latham Sur, 3/4 mi w ext.	9-24-53	7600	5856- 5860	Frio sd; Olig.	F 132; 9/64"	39
		TEXAS DISTRICT 2—GAS FIELD EXTENSIONS						
Jackson	Morales, East	South Texas O&G Co.'s G. R. Williams 1, I&GN RR Co. Sur, A-185, 1/2 mi sw ext.	7-17-53	3530	3450- 3462	Frio sd; Olig.	F 7.4 mln	....
Jackson	Navidad	South Texas O&G & Tri-Mark Oil Co.'s W. H. McClure & G. E. Bonham 1, Jno. Andrews Sur, 1 mi e ext.	9-17-53	4774	3862- 3870 4040- 4046	Oligocene Oligocene	F 44.5 mln; op F 28.5 mln; op	....
		TEXAS DISTRICT 3—NEW OIL FIELD						
Harris	S. Webster	Ivy Minerals Corp.'s Williams States Jacob 1, Robert W. Wilson Sur.	8-22-53	9490	9446- 9452	Frio sd; Olig.	F 83; 19/64"	39
		TEXAS DISTRICT 3—NEW OIL PAYS						
Colorado	Cecil Noble, W	C. N. Housh's American Legion et al Unit 1, E. Tumlinson Sur.	9- 8-53	10320	9670- 9678	Wilcox sd; Eoc.	F 240; 19/64"	33
Colorado	Glasscock	Tennessee Prod. Co.'s C. G. Glasscock 4, BBB&C RR Sur.	9- 7-53	5500	4412- 4416	Cockfield "A" sd; Eoc.	F 33; 9/64"	33.7
Wharton	Mauritz, East	John B. Coffee's Kountze & Stewart C-6, Morris & Cummings Sur.	9-30-53	8977	5718- 5722		F 114; 7/64"	41.1
		TEXAS DISTRICT 3—NEW DISTILLATE FIELDS						
Hardin	Dorsey	Houston Oil & American Republic's Emma B. Sternenberg 1-A, G. Dorsey Sur	8-26-53	8015	7460- 7364	Yegua sd; Eoc.	F 190 dist; 4.3 mln	63.8
Matagorda		Shell's L. W. Kain et al 1, James Duncan Lge & Labor	8-22-53	7351	6015- 6028	Miocene	F 29 dist; 14.5 mln	43
Orange	Doty, East	Sun Oil Co.'s B. Williams 1, M. S. McAlphin Sur.	8-31-53	8570	8095- 8110	Hackberry sd; Olig.	F 176; 9/64"	49
		TEXAS DISTRICT 3—NEW DISTILLATE PAYS						
Harris	Clinton	Eddy Refining Co.'s K. S. Saunder 1, Reels & Trobough Sur, 1/2 mi nw of prod.	1- 5-53	8857	8458- 8463	Yegua Moody sd; Eoc.	F 160 dist; 8.0 mln	47.5
Tyler	Wurtsbaugh	Shell Oil Co.'s Kirby Lbr. Corp. Tr 170-A-1, C. C. Tyler Sur.	8- 1-53	9830	9132- 9151	Wilcox sd; Eoc.	F 875 dist; 4.7 mln	71
		TEXAS DISTRICT 4—NEW OIL FIELDS						
Hidalgo		Sunray's A. W. Beaurline et al 1, Santa Anita Grant	9-21-53	9201	5650- 5655		F 71; 13/64"	53.2
Zapata	Elenterio	J. B. Vassey's E. Lopez 1, Sur 288	7-22-53	993	991- 992	Cole sd; Eoc.	P 8	28
		TEXAS DISTRICT 4—NEW OIL PAYS						
Aransas	Fulton Beach, West	Sun's Copano Bay Tr 104-5, Subd of Copano Bay St. Tr. 104	9-18-53	8581	7061- 7066	Frio (E-1) sd; Olig.	F 192; 9/64"	38.4
Hidalgo	Tabasco	Houston Oil-American Republic's Everett Bell et ux 1, Porc. 76, Homeville Assoc. Subd, Sect D. Blk 42, Lot 2.	8-31-53	9513	8678- 8686	Vicksburg sd; Olig.	F 68; 1/4"	47.6
		TEXAS DISTRICT 4—NEW DISTILLATE FIELD						
San Patricio		H. R. Smith's S. L. Webb, Jr. 1, Kenny & Pease Sur, Blk 27	8-25-53	10014	5780- 5784	Frio sd; Olig.	F 95 dist; 9.4 mln; open	57.9
		TEXAS DISTRICT 4—NEW DISTILLATE PAYS						
Aransas	Puerto Bay	Arkansas Fuel Oil Corp.'s State of Tex. Puerto Bay Tract 4-1	9- 4-53	7493	6792- 6798 6805- 6811	Frio sd; Olig.	F 374 dist; 21.5 mln; open	60.2
Jim Wells	Alice-Deep	Fidelity O&R Co.'s Reed & Lindsay Unit 6, La Vaca Grant	8-30-53	8533	8155- 8200	Yegua sd; Eoc.	F 40 dist; 12.0 mln; open	....
San Patricio	Section Two	Superior's Minnie S. Welder 2-2, E. Portilla & C. J. Francisco Sur, Sect 1.	8- 1-53	6720	6116- 6124		F 37.2 mln	55.1
		TEXAS DISTRICT 4—DISTILLATE FIELD EXTENSION						
Jim Wells	Alfred, West	Calvert & Manley's O. S. Adams 1, Robt Adams Sur 6, A-3, 1/2 mi w ext.	9-22-53	5225	4294- 4303	Frio sd; Olig.	F 10 dist; 20.0 mln; open	63
		TEXAS DISTRICT 4—NEW GAS FIELD						
Jim Wells	Kaylin	Wymore Oil Co.'s Laughlin Unit 1-1, Sect 75, R. P. Haldeman Subd, Juan Jose Manuel de la Garza "San Francisco" Grt.	6-28-53	3790	3181- 3191	Singer sd; Olig.	F 4.7 mln	....
		TEXAS DISTRICT 5—NEW DISTILLATE PAY						
Navarro	Reka	Lawton Oil Corp.'s G. C. Baker A-1, J. W. Orr Sur.	9-12-53	7653	7284- 7298	Travis Peak sd; L. Cre.	F Dist; 4.4 mln; open	....
		TEXAS DISTRICT 6—NEW OIL FIELDS						
Anderson	N.E. Neches	Humble's Northeast Neches Oil Unit 1-1, F. Cubier Sur.	9-24-53	5493	4704- 4710	Woodbine sd; U. Cre.	F 139; 5/16"	39.8
Franklyn		Humble's A. C. Ballard et al 1, in J. C. Elder Sur.	9-25-53	8531	8232- 8250	Rodessa sd; L. Cre.	P 124; 2 1/2 wtr	43.4
Smith	Wright Mtn.	Humble's Hubbard Timms 1, George W. Slaughter Sur.	9- 4-53	8323	8015- 8021 8028- 8032	L. Pettit li; L. Cre.	F 197; 1/4"	41.6
		TEXAS DISTRICT 7-C—NEW OIL FIELDS						
Reagan		Stanolind's TXL F-1, Sect 225, Blk 1, T&P Sur.	9-12-53	9745	2410- 2480	Grayburg li; Perm.	P 139	29
Runnels	Hull-Dobbs, E.	Ohio Oil Co.'s C. W. Burford 2, G. W. Denton Sur. 468, 1/2 mi ne ext.	8-29-53	4003	3925- 3972	Gardner sd; Penn.	F 318; 1/4"	36.3
Runnels		Murray Pet. Co.'s V. B. Briley 1, Sect 321, Blk 64, H&TC Sur.	9-27-53	4620	3862- 3868	Morris sd; Penn.	F 192; 19/64"	38.2
Schleicher		Edwin L. Cox's Runge 1, Sect 67, Blk M, GH&SA Sur.	9-10-53	5594	5550- 5568	Strawn sd; Penn.	F 339; 1/4"	42
		TEXAS DISTRICT 7-C—NEW DISTILLATE FIELD						
Crockett		Shell's Friend 1, Sect 93, Blk GH, GC&SF Sur.	9- 1-53	8490	8340- 8435	Ellenburger li; Ord.	F 28 dist; 0.6 mln; 1"	78.1
		TEXAS DISTRICT 8—NEW OIL FIELDS						
Andrews	Block 9	Atlantic Ref. Co.'s University "9-A" 1, Sect 13, Blk 9, Univ. Lds. Sur.	9- 8-53	8950	8430- 8448 8458- 8500	Wolfcamp li; Perm.	F 423; 49/64"	35.5
Andrews		Fred Turner, Jr.'s J. E. Parker 1, Sect 19, Blk A-44, PSL Sur.	9-19-53	8676	8556- 8624	Wolfcamp li; Perm.	F 348; 3/4"	36.6
Cochran		Leland Fikes et al's Lloyd Evans 1, Sect 15, Blk Y, PSL Sur.	9-19-53	4940	4920- 4940	San Andres li; Perm.	F 34; 3/4"	30
Dawson	Spraberry W.	Seaboard's Herman Pettaway 1, Sect 40, Blk 34, T-5-N, T&P Sur.	9- 1-53	8203	8060- 8098	Pennsylvanian li; Penn.	F 531; 1/4"	40.4
Gaines		Humble's Angela Brumley et al 1, Sect 8, Blk A-12, PSL Sur.	9-18-53	11092	7590- 7645	Wichita-Albany li; Perm.	P 38; 22 wtr	27
Howard	Luther, S.E.	Texas Pacific C&O Co.'s Tom Spencer 1-A, Sect 14, Blk 32, T-2-N T&P Sur.	9- 7-53	10092	9855- 9880	Siluro-Devonian	F 428; 29/64"	43.5
Scurry	Corazon	R. L. Zonne & Coronet Oil Co.'s E. G. Browning 1-574, Sect 574, Blk 97, H&TC Sur.	8-25-53	8307	2139- 2200	San Andres li; Perm.	F 28; 15 wtr; 1/2"	32.8
Sterling	Durham	Harris & Walton's Omey Davis 1, Sect 3, Blk T, T&P Sur, 1 mi nw ext.	9- 7-53	1513	1418- 1462	San Andres li; Perm.	P 36; 2"	33
		TEXAS DISTRICT 8—NEW OIL PAYS						
Crane	Abell	Forest Oil Corp's C. E. Switzer 1, Sect 16, Blk 1, H&TC Sur.	9- 7-53	6780	5245- 5530	Devonian li; Dev.	F 173; 25/64"	41.1
Ector	Penwell	Dekalb Agricultural Assn, Inc.'s W. E. Connell 2, Sect 4, Blk B-16, PSL Sur.	9-16-53	4607	4420- 4607	Glorietta li; Perm.	F 115; 3/8"	35.4
		TEXAS DISTRICT 8—OIL FIELD EXTENSIONS						
Andrews	Magutex-Devonian	Magnolia's U;Tex Lease 36990-1, Sect 8, Blk 8, Univ. Lds Sur, 1 1/8 mi ne ext.	9-17-53	12642	12528-12541	Devonian li; Dev.	F 211; 39/64"	41.4
Cochran	Levelland	Landa Oil Co.'s F. O. Masten 1, Lab 7, Lge 152, Randall CSL Sur.	7-23-53	4976	4948- 4976	San Andres li; Perm.	P 122	29
		WYOMING—NEW OIL FIELDS						
Crook	Grasshopper Butte area	M. D. Miller's Barton 2, NW NW 31-50n-66w.	7-10-53	1671	1655- 1671	Muddy sd; U. Cre.	P 50	39.4
Fremont	South Sand Draw area	Sohio Pet. Co.'s Unit 1, SE NW SE 36-32n-95w.	9- 5-53	8792	8600- 8616	Tensleep sd; Penn.	P 407	....
Natrona		Houston Oil's Unit 2, NW NW NW 18-37n-78w.	9- 2-53	8367	6658- 6672	Dakota sd; L. Cre.	F 66; 1/4"	....
Washakie	Cottonwood area	Stanolind's Unit 1, C SW SW 2-47n-91w.	9- 1-53	7552	7270- 7294	Phosphoria li; Perm.	P 193	....
		WYOMING—OIL FIELD EXTENSION						
Johnson	Sussex, West	Walter G. & Mark J. Davis' Gov't 1, NE NE NE 3-42n-80w, 1/2 mi nw ext.	9-15-53	2835	2760- 2835	Shannon sd; U. Cre.	F 492; 3/8"	....
		WYOMING—NEW GAS FIELD						
Sublette	Big Piney area	Arthur B. Belfer's Government B-4, NE SW 26-29n-113w.	9- 2-53	3501	3427- 3501	Cretaceous	F 21.7 mln; open	....

[1] Character of producing formations abbreviated thus: ch, chalk; dolo, dolomite; li, limestone; sd, sandstone; sh, shale; ser, serpentine; cgl, conglomerate. Ages of formations abbreviated thus: Plio, Pliocene; Mio, Miocene; Olig, Oligocene; Eoc, Eocene; U. Cre, Upper Cretaceous; L. Cre, Lower Cretaceous; Jur, Jurassic; Tri, Triassic; Perm, Permian; Penn, Pennsylvanian; U. Miss, Upper Mississippian; L. Miss, Lower Mississippian; Devo, Devonian; Sil, Silurian; Ord, Ordovician; Cam, Cambrian.

[2] Barrels of oil per day (24 hour rate), flowing (F), pumping (P), swabbing (SW), or bailing (B); or million cubic feet of gas daily open flow capacity; size of choke in inches.



HIGHEST DRILLING WILDCAT IN U. S. is almost two miles up and headed one and a half miles down. It's Three States Natural Gas Company's C. K. Steiner 1, situated about 500 feet from Utah's Skyline Drive and about 9 miles from Clear Creek field on the Wasatch plateau. Elevation of kelly bushing is 10,296 feet above sea level.

Problems are fantastic in this fabulous gas discovery of Central Utah. It's the U. S.' highest field, where mud pits disappear, the temperature drops to 30 below, abandoned coal mines are a hazard, and there's . . .

A Crisis Every 30 Minutes

By DONALD M. TAYLOR, WORLD OIL Staff

"IT'S LIKE drilling through a pile of loose stones," explained Harold Hawkins, Three States Natural Gas Company's district superintendent. He was describing drilling operations in the almost-two-miles-high Clear Creek field in central Utah. "It's difficult to keep the hole straight, and almost impossible to maintain circulation for any length of time. We've lost returns as shallow as 16 feet, and in one case, we even lost a reserve mud pit when its bottom opened up."

"As a matter of fact," he added, "We just completed a 4400-foot well that had no returns at all below 300 feet."

But lost circulation and hole deviation are merely two of hundreds of difficulties that are being overcome in Three States' development of the U. S.' highest field. For instance, each new location calls for construction of miles of roads through mountainous terrain. And in some cases, the location itself is but a niche blasted into the steep slope of the mountainside. These roads and locations are constantly bombarded by falling rocks, snow, and tree slides. There's always the threat of a major landslide.

In winter, temperatures frequently dip to 30 below, and snow piles up 18 to 35 feet deep. Snows may start in early September and continue until late spring.

There are personnel problems that grow out of the field's isolation. Employes are housed in a trailer village, 46 miles from the nearest grocery store, drug store, and movie. Sometimes snows cut the village off from the outside world.

These are but a few of the problems. New ones crop up every day. As Cliff Davis, Three State's assistant district superintendent, describes it, "We have a new crisis every thirty minutes."

But the rewards are rich. Potentials of the wells range from 6-136 million cubic feet of gas per day. And geologists conservatively estimate the field's reserves to be at least 1¼ trillion cubic feet. Moreover, the strategic location of the field enhances its value. Burgeoning industries of Salt Lake City, 100 miles away, provide a ready market for a portion of the gas, and the gas-hungry industries of California

HIGHEST PRODUCER IN U. S. is being drilled in with gas in Clear Creek field at elevation of 9754 feet above sea level. Gas and cuttings blow out the "pipe organ" at right. Flames are almost 100 feet high.

IT'S TRICKY BUSINESS drilling in to the high-pressure pay zone with gas. Left to right are: Toolpusher Lorn Jackson, Driller Jess Robertson, and Harold Hawkins, Three States district superintendent.

can absorb any surplus above Utah requirements.

This field is the first major discovery in the Wasatch Plateau that lies just southwest of the great Uinta Basin. It is one of a series of faulted anticlines located amidst a range of mountains that vary from 8700 feet to 11,500 feet in elevation. Production comes from a 470-foot-thick section of interbedded shales and sandstones in the Cretaceous. There are seven of these sandstone sections which have a combined thickness of 115 feet. They are produced simultaneously from a common bore hole. Depth of the wells runs from 4200 to 6400 feet, depending on the elevation of the drill site.

The well that unlocked this fabulous gas reserve and opened a new horizon for future exploration, was completed in November, 1951. Here's the way J. W. Wilson, Three States' general superintendent, describes the early days of the field.

"At the beginning of development operations, there was little or no equipment or services available in the area, and contractors could not be enticed to bring crews and rigs into the area. We moved our own personnel and equipment from Farmington, N. M., in the San Juan Basin and other places of greater distance. Both personnel and equipment had to be the best obtainable, since the 8000 to 11,000 altitude robs them of about 30 percent efficiency.

"Clear Creek was served by a single dirt road coming off of U. S. Highway 50, 28 miles to the north. At that time there were no roads in the mountains, only a few National Forest Ranger trails. We set up a temporary camp base near Clear Creek and completed the first five wells.

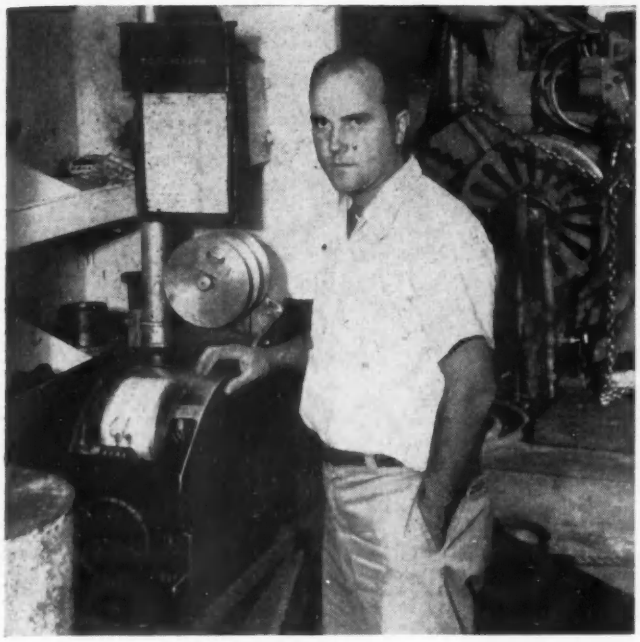
"Things are better today. We have a main field base consisting of office, warehouse, equipment yard, pipe yard, railway spur and house trailer camp at Scofield, six miles north of Clear Creek in Pleasant Valley. These installations were erected as portable as possible so that they could be moved at some later date, as development progresses over this prospective large gas productive area. There's an oil well cementing company at Price, Utah, 45 miles away, which is a great advantage, since all other drilling service companies are located 350 miles away."

Locations. From start to finish, the drilling operation is a complex pattern. Take for example, the matter of making locations. In ordinary practice, geologists have to consider only structure and property lines in choosing a drill site. But it's different at Clear Creek.

First the geologist must check maps of all of the old coal mines in the area to be sure that the proposed hole will miss them. Then there's the matter of water supply. He must choose a site where springs, streams, or underground water will be available. Too, there's the problem of gas supply. The best results are obtained when the wells are drilled-in with natural gas, and there is a limit as to how far it can be economically piped in the mountains.

Once the site has been selected, engineers and construction crews begin the backbreaking task of building roads up the sides of the mountains and preparing a location for the rig. Bulldozer operators start blading away at raw mountainside; and with incredible swiftness, a wide mountain road, that would be a credit to any highway department begins to take shape. It must have no more than 8 to 10 percent grade and be able to support 50-ton loads.

District superintendent Hawkins believes that these 'dozer operators have more nerve than any men he has ever met. Pointing to the side of a road that would have made an excellent "suicide leap," he says, "It takes nerve just



TIME DRILLING LOG is used to detect top of 470-foot thick pay zone which has seven sandstones interbedded with shale. Geologist Walter Zabriskie checks the log.

SPECIAL EQUIPMENT is required for drilling into high-pressure gas. Here District Superintendent Hawkins points to drilling-in rotating head. Special blowout preventers are used.

to step up and look over the side. Just imagine what it's like shoving a load of dirt over. Several times 'dozers have gone down the mountainside, but fortunately we've had no fatalities yet."

One of the most unusual features of the road building has to do with the trees that are uprooted. Utah law requires that pine, spruce and fir be salvaged and sold. Aspen that make up the bulk of the mountain forest must be trimmed of leaves and branches and laid in orderly stacks parallel to the road. This rather curious operation requires the full time service of a crew of men.

Costs of the roads vary with the terrain and rock. In one case, seven miles of road was constructed for only $3000. In another case, 1000 feet cost almost $7000. The average cost of all of the roads that Three States has constructed is about $4000 per mile.

All told, Three States has 104 miles of roads in the mountains serving 25 well locations. This seems high, but it all fits in with the company's plan to use the latest conservation practices in developing the field. For as a Three States' official explains, "To properly drain the gas from the reservoir, the well locations must be spaced properly on the surface. For this reason, some are in canyons, some are on the sides of mountains and some are on top of the mountains."

Moving In. Because of the difficulties of moving-in and setting-up, Three States uses jack-knife derricks. Where moves are short, crews simply lay the derrick on two lowbed trailers, and with one truck backing and the other pulling forward, they move it intact to the new location.

At the present time, Three States has five rigs running in the field, four rotaries and one cable tool.

Water supply is one of the first problems that must be whipped at any new location. In most cases, it must be piped from springs or streams miles away and sometimes 1000 feet or so below the rig. Crews wage a constant battle in winter to keep the lines as well as the water source from freezing up.

One of the most noticeable things about one of the drilling rigs is the bountiful supply of lost circulation materials on hand. They may include gel flakes, green coal, wood chips, or cotton seed hulls. (There have been instances where burlap bags were used.) No weight materials are added to the mud, only gel, caustic, and phosphates as a rule.

Where water supply is plentiful, the problem of maintaining circulation is sometimes simplified. If the thief zone is fairly high up in the well, pure water can be used as a drilling fluid and cuttings allowed to wash into fissures and caverns. The only problem is to maintain high enough level in the annulus to prevent caving below. Even so, this practice may call for one or two fishing jobs before the well is completed, but it is still economical. Fishing jobs often cost about $2000 apiece; lost circulation material can easily cost $35,000 per hole.

In most cases, water supply is limited and crews make great effort to maintain circulation. For example, when making a trip with drill pipe, they take 45 seconds to lower each three-joint stand of pipe. This prevents surges that could reopen fissures that have been clogged by the lost circulation material. Trips out of the hole are usually made with equal care.

Drilling and Completion Practice. The drilling and completion practice for the wells was devised by J. W. Wilson, Three States' general superintendent. Conductor pipe is seldom used, but crews usually set and cement 300 feet of 15-inch surface pipe. Then, using 9⅞-inch rock bits, they drill on down to the top of the pay zone, which is usually identified by drilling-time logs. For most holes, the average bit life is something like 40 feet, and the over-all penetration rate runs about 3 to 4 feet per hour, excluding waiting and trip time.

Ordinarily, drillers carry little weight on the bit in an effort to keep the hole straight while penetrating

NO RETURNS betwen 300 and 4400 feet. Driller M. A. Sarsfield poses by a bone-dry shale shaker on P. T. Walton 1-X. Water and sawdust were pumped into hole and cuttings allowed to wash into thief zone. Pay zone was drilled with gas. Potential on this well was 136,000,000 cubic feet per day.

MOUNTAIN ROAD constructed by Three States. The company has 104 miles of roads to service 25 locations. About 50 miles of this total was formerly only mountain trails. The cost of the roads varies with terrain. Average cost of roads Three States has built is about $4000 per mile.

formations whose dip may vary from horizontal to vertical. As a rule, drillers turn the rotary table at 90 revolutions per minute and carry about 15,000 pounds on the bit.

Three States' crews never penetrate the pay zone with water or drilling fluid. The sandstones that make up the pay section have only ten percent porosity and the entire section is highly bentonitic. Water completely blocks production, and for this reason, casing is set just above the first sand section.

Crews run-in seven-inch casing with float collar, guide shoe, and 60 feet of scratchers on the bottom. Cementing starts with 20 sacks of quick-set cement followed by 50 sacks of gel-cement mix, which in turn, is followed by 120 sacks of ordinary cement. The first 20 sacks are run ahead of the slow-setting gel mix because they set up fast and permit the top of the cement to be detected a short time later by a temperature survey.

Once the cement is set, drillers use plain water to drill within six inches of the guide shoe. Then the water is blown from the hole with gas in three or four stages. Meanwhile, crews have piped gas from an adjacent well and the last and most hazardous operation is ready to begin.

Using high-pressure gas piped into the stand pipe, crews drill the guide shoe and start penetrating the pay zones which have a pressure of 1250 pounds per square inch. For this operation, they reduce speed of the rotary table to 40 RPM and allow only 5000 pounds weight on the bit. The volume of gas increases as successive pay formations are penetrated. The method of disposing of the cuttings is shown in one of the accompanying photos.

RADIO IS IMPORTANT in development of this fabulous gas field. Here Cliff Davis, assistant superintendent, talks with a toolpusher on a rig 24 miles away.

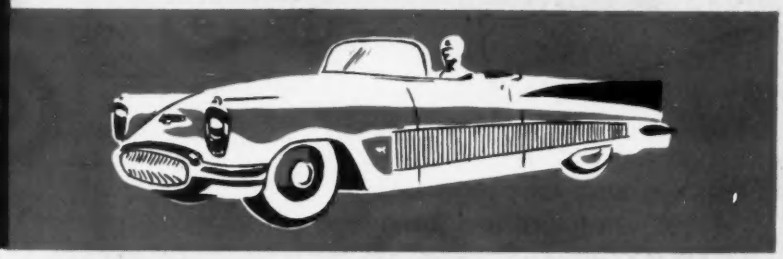
The completion of the well is simple. Tubing is set at the bottom of the casing and all seven or eight sand sections produce from the common bore hole. At the surface, the christmas tree is encased in a heavily reinforced concrete box that measures about eight feet on a side and stands about the same distance above the ground. It has a lid of heavy steel. The purpose of this structure is to protect the wellhead from snow slides and loose rock that occasionally tear down the mountain side.

Because of the complications involved in drilling in the Clear Creek field, drilling costs runs as high as $35 to $40 per foot. But even so, payout is economical.

As a gas producer, the importance of Clear Creek field is assured. But it has an even greater importance—it opens up the great area of the Wasatch Plateau for exploration and development. **—The End.**

DON'T BUY AN OBSOLETE RIG!

A JAW CLUTCH TRANSMISSION RIG IS NOW OBSOLETE!



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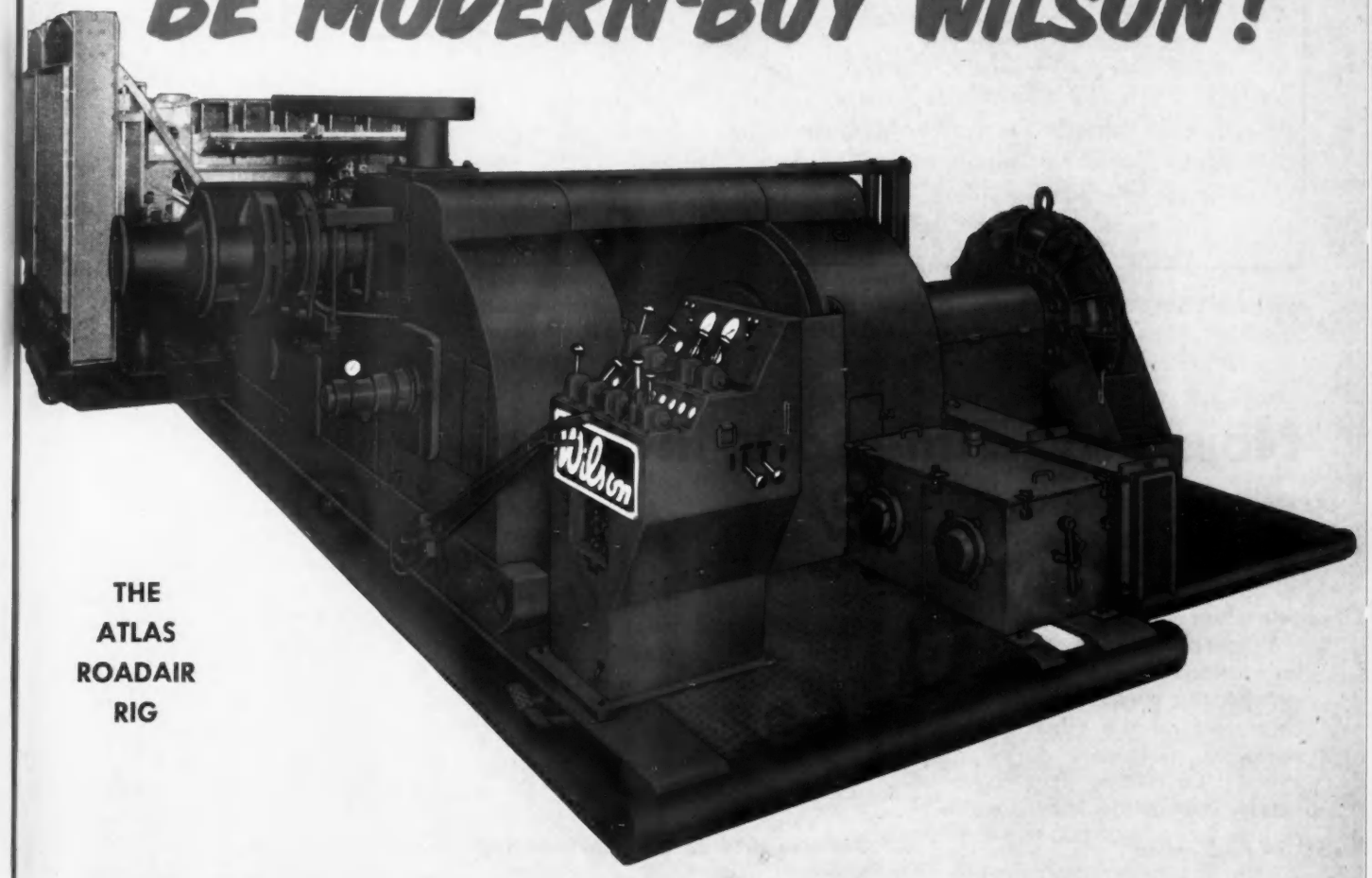

THE ATLAS ROADAIR RIG

The old style rigs still on the market use jaw clutches. Wilson Giant, Atlas, Titan and Super Titan Rigs use Air-Tube disc friction clutches in the compound drives, transmissions and *drums*. Why stop your rig to change speeds?

The FIRST NAME in DRILLING RIGS

WILSON MANUFACTURING CO., Inc.

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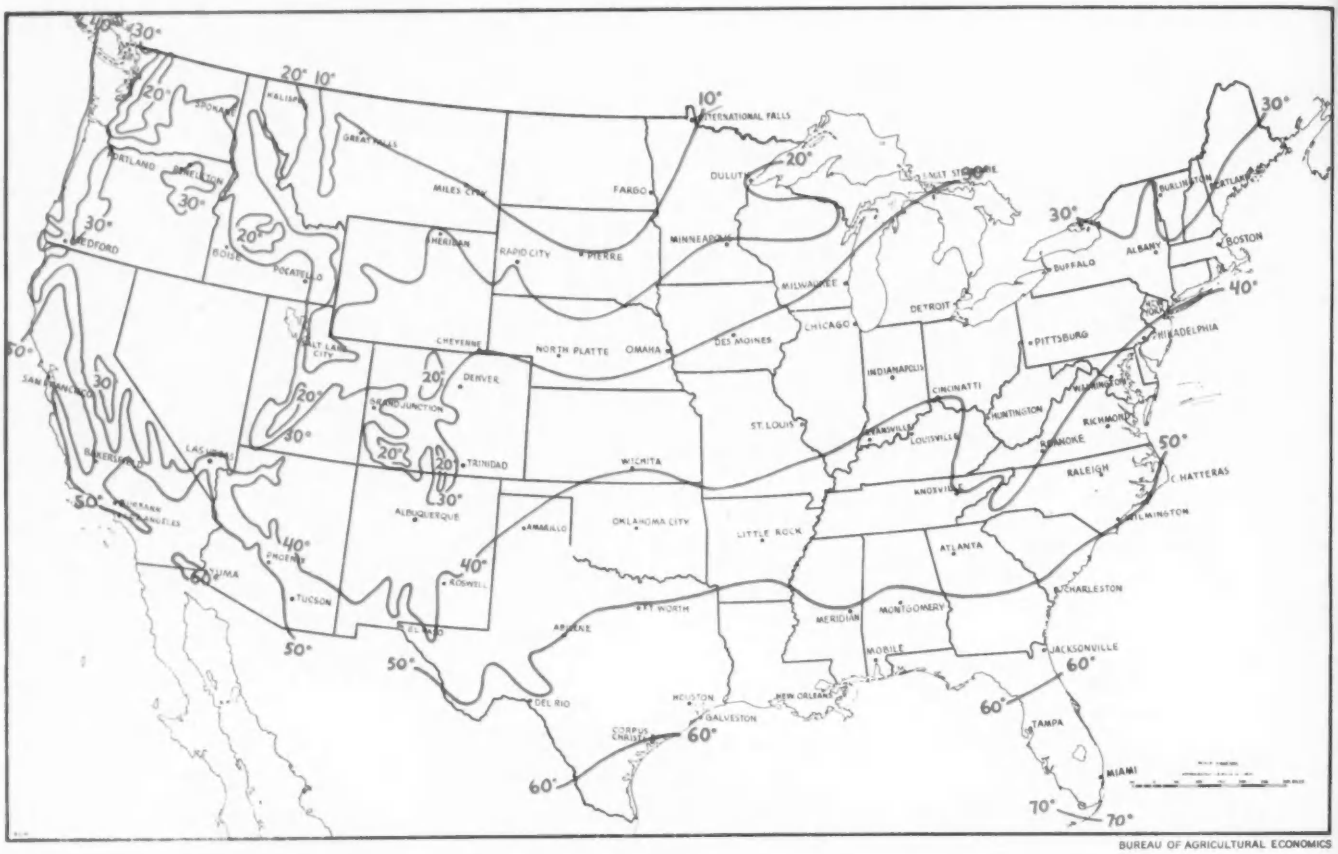

BUREAU OF AGRICULTURAL ECONOMICS

WHAT'S THE TEMPERATURE? This map shows lowest monthly mean temperature across U. S. during November, based on records of 600 first line U. S. Weather Bureau stations over 50 years.

Now's the Time to Winterize!

IMPORTANT PREVENTATIVE maintenance services should be performed on all drilling engines, tractors and trucks before and after winter.

Proper operation of engines depends on satisfactory lubrication, and function of the cooling system. Each is dependent on the other for proper operation, particularly during winter months. Of course, other engine accessory systems should be serviced:

- Fuel system
- Exhaust
- Electrical including battery
- Engine adjustments and clearances

Winter affects each, but the cooling system suffers most.

Frozen Coolant

1. Operation of the engine with frozen coolant may shear water pump impeller pin and leave impeller loose on the shaft.

2. The above might cause slippage of the pump belt drive — result in burned belt.

PREVENTATIVE SUGGESTION: Test coolant for color and cleanliness weekly. Draw sample into a hydrometer or antifreeze tester. Coolant having oily, rusty appearance should be discarded and system should be cleaned.

General Winter Trouble-Shooting Ideas

- Observe engine temperature gauge frequently during freezing weather.
- Inspect the cooling system for leakage, for it may result in overheating, possible mechanical breakdown, and engine failure.
- Check hole connections, gaskets, pressure caps, and other water joints.
- Keep radiator mounting properly adjusted and promptly detect and correct the smallest leak.
- Install corrosion inhibitor with water, and discard rusty antifreeze that could result in corrosion of water pump impeller or housing.

PREVENTATIVE SUGGESTIONS:

- Don't operate an engine in which there is the slightest doubt as to the possibility of frozen radiator or coolant. Stop engine immediately.
- Low engine operating temperature especially, during freezing weather, results in excessive fuel consumption, dilution of engine oil by unburned fuel, and formation sludge from condensation of water in cylinders and crankcase.
- Prevent internal leakage of coolant into the engine (if possible) as it can cause serious damage when either water or antifreeze solution is mixed with engine oil. Sludge and lubrication problems develop. Rapid rust formation also is possible. It is always important to maintain adequate protection against the coldest weather expected.

AUTOMATIC PIPE HANDLING UNIT ON THE RIG...

CAT* ELECTRIC SETS IN THE DOGHOUSE

Round trips are made on this rig without drill pipe being touched by hand! A major oil company is operating this rig, with an improved type of automatic pipe handling equipment, near Monahans, Tex.

And in the doghouse are two Caterpillar D8800 Electric Sets to provide the dependable electric power so important to this installation.

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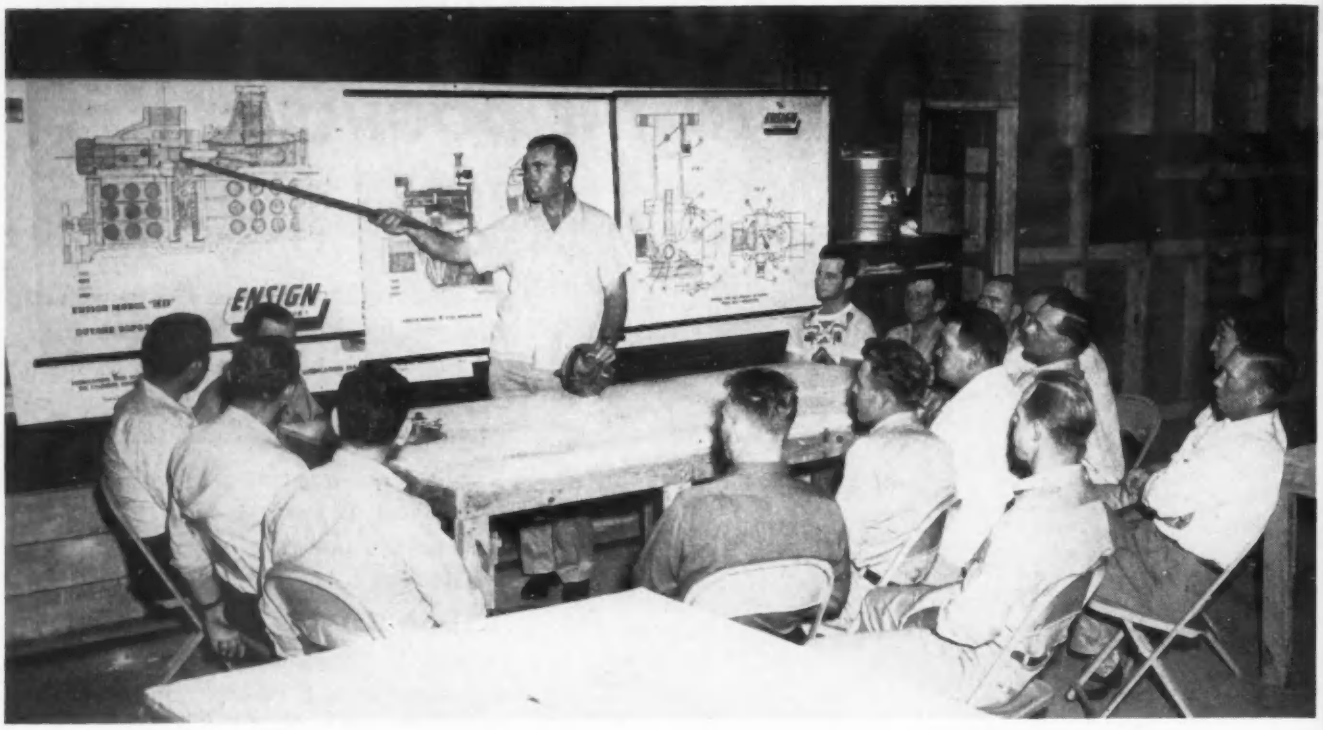

PROPER TRAINING is a must for good maintenance. Here a group discusses the butane vaporizer, "B" regulator, and gas carburetor as used on spark ignition engines.

What Should Be Done To Protect Engines?

By following a few fundamental rules you can increase engine life and lengthen the time between major overhauls.

By JOHN A. BOATMAN, George Engine Company, Inc., Harvey, La.

SINCE THE END of World War II, the amount of time available for routine upkeep of drilling engines has decreased considerably. Due to the sharp increase in the rate of penetration afforded by new bit design and new drilling techniques, the majority of engine check-ups and repairs must now be made during drilling operations.

During these years since 1945, progress in the design and manufacture of drilling engines has advanced steadily. As new models and types appeared on the market, new methods of operation and repair were necessary in order to realize the optimum in economy and efficiency.

Once the engine has been placed in operation, the owner has a choice of providing one of two types of maintenance.

- He may select preventive maintenance along the lines of Benjamin Franklin's "a stitch in time saves nine."
- He may operate the machine until a failure occurs and then "pick up the pieces." The latter requires remedial maintenance.

Increased life of the engine in general, and longer periods of time between major overhauls, can be gained by the strict observance of a few fundamental rules in daily operation. Since all rigs do not have an excess of prime motive power, and likewise do not have a full time engine operator or motorman, the points of daily care will center around the most likely cause of engine trouble. These include the cooling system, the lubrication system, and the fuel system.

Excess heat from the flame of combustion must be carried away rapidly and completely if serious damage to the engine is to be avoided. Some form of liquid is normally used as the cooling medium. Water is an ideal coolant because of its ability to absorb heat rapidly and the ease with which it can be circulated through the cooling system by a pump. Pure water should be treated with a rust inhibitor such as soluble oil or bichromate of soda. A 5 percent solution of soluble oil, such as the cooling fluid used by machine shops, will retard rust corrosion. Should bichromate of soda be used, the PH of the solution should be maintained around 8.0 to 9.0 with periodic additions made due to evaporation or leaks and the need for adding make-up water.

Should the water contain mineral salts or other impurities of that nature, a water softener should be used. Scale deposits in the cooling system will im-

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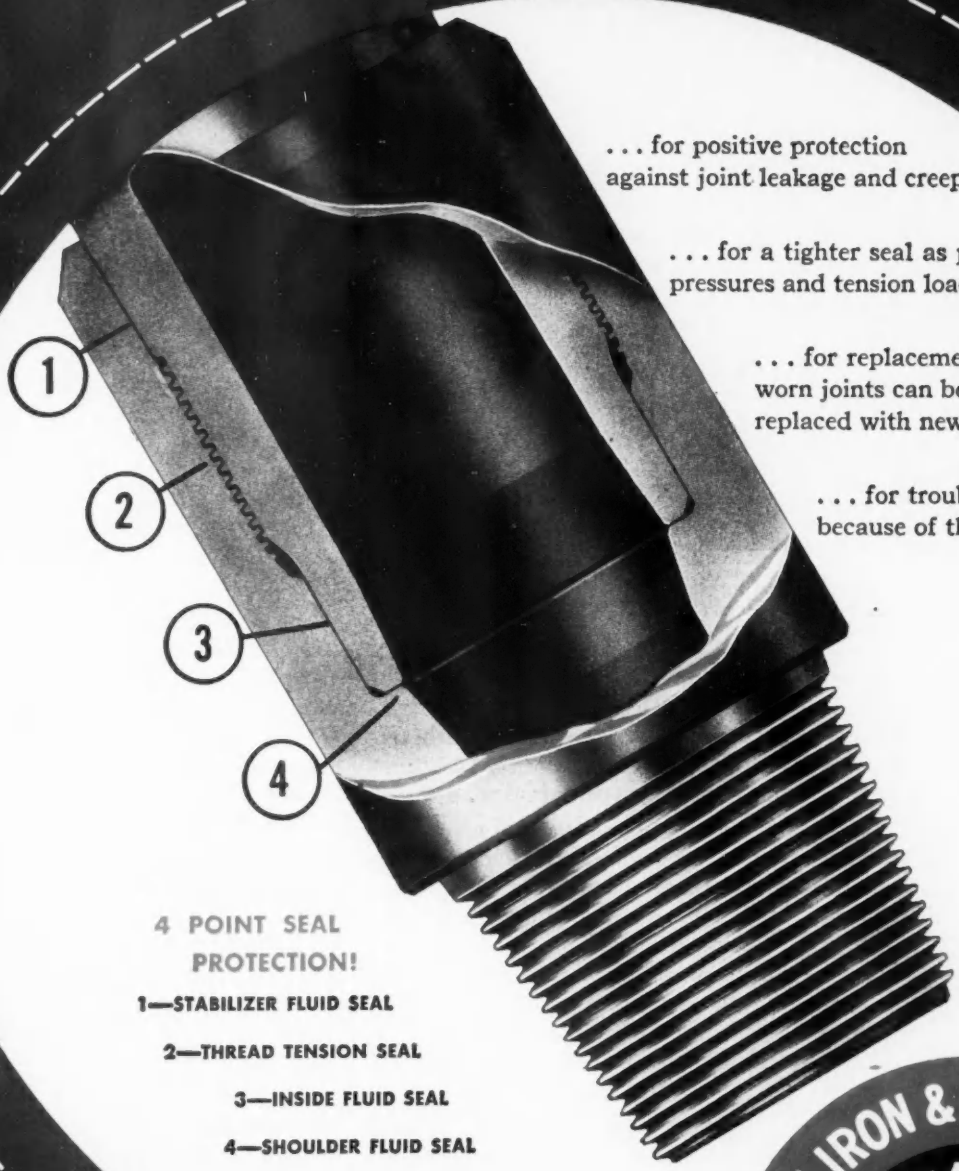

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pede the efficient transfer of heat into and from the coolant and will contribute to overheating, cracked cylinder liners, cylinder heads and warped exhaust valves.

Two Types. There are two basic types of cooling systems; open and closed. The open cooling system usually employs a cooling tower or spray pond and the engine jacket water is circulated through this open system where the water is aerated and cooled in the open air. Undesirable features of this system are the large amounts of make-up water required due to evaporation and the formation of algae.

Closed cooling systems use either radiators or heat exchangers for the transfer of excess heat from the jacket water to the atmosphere. Most land rigs use radiator cooled engines because of the absence of raw water for the heat exchangers. Some land rigs, however, use heat exchangers in conjunction with cooling towers or spray ponds. Barge rigs normally use heat exchangers because of the abundance of raw water. The use of radiators on barge rigs is sometimes the source of cooling problems. Engine room temperatures during the hot months retard the efficient transfer of heat from the engine and radiator to the surrounding air.

Heat exchanger equipped engines develop more horsepower than do the same engines which employ a fan and radiator. Because of this additional horsepower gained for operation of the rig equipment, and the cooling problems encountered in closed engine rooms, many of the modern barge rigs are so equipped.

Paint spray guns should not be used around radiator equipped engines while they are in operation. The thin coat of paint which will be deposited on the radiator core will impede the efficient flow of heat into the atmosphere. In fact, engines should not be painted periodically the same as drawworks, pumps and other rig machinery. Several coats of paint will insulate the engine block and will prevent the proper escape of excess heat to the air. Such practice may lead to local hot spots, resulting in cracked heads, liners, jackets, and seized pistons.

Water Circulation. The circulation of the jacket water is provided by a fresh water pump. Most fresh water pumps are of the centrifugal or impeller type. Most of the maintenance of water pumps centers around the bearings and the shaft packing or seal. Pump bearings should be well lubricated and water should not be allowed to contaminate the bearing lubricant. Should bearing wear occur, the shaft will deflect and lessen the life of the gland packing.

Excess or severe bearing wear may cause the impeller to strike the pump body and cause complete failure. Gland packing should not be too tight. A few drops of water per minute should leak through the packing for cooling and lubrication purposes. During repair shutdowns in freezing weather, the pump body should be drained as well as the engine block. A small pocket of water in the pump body will provide enough ice to foul the impeller and cause a serious failure when the engine is started again. Should the water pump be designed for periodic lubrication, a separate grease gun, using special water pump grease, should be provided for this purpose. General rig grease should not be used in the water pump.

It is good practice to install a pressure gauge in the water pump discharge manifold. Any change in water pressure, for a given engine speed, will indicate water pump trouble or clogging of the cooling system. A suitable anti-freeze solution should be used during cold months if freezing temperatures are common to the area. The water conditioners and inhibitors mentioned earlier should not be used with anti-freeze. Permanent type anti-freeze solution have their own inhibitors which may not be compatible with inhibitors added in the field.

Zinc electrodes should be used in the raw water system to control electrolysis. This is especially true if sea water is used in the raw water system. Electrolysis will attack some metals in preference to others. Zinc is preferred over iron and for that reason ample zinc plates or plugs should be installed in the raw water system in order to minimize damage from that cause.

Should the engine overheat, due to failure of the cooling system, it should be stopped at once. The engine should be allowed to cool gradually by natural means. Under no circum-

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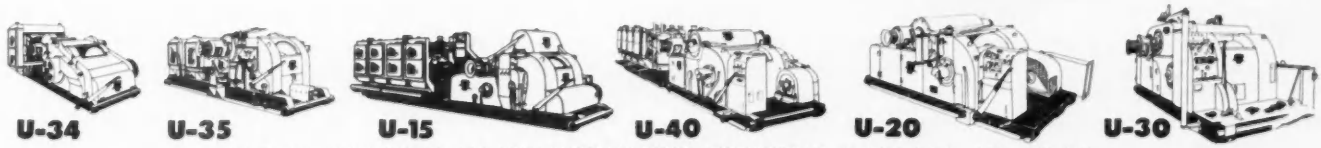

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stances should cold water be added to the cooling system. It may be permissible to add hot water in very small quantities. The hot water will immediately turn into steam upon coming into contact with the cylinder jackets and the steam may help to cool the engine.

Whereas, failure of the cooling system and overheating of the engine seldom causes serious damage, lack of lubrication over an extended period always results in costly damage to bearings, crankshafts and other moving parts of the engine.

The prime purpose of the lubricant is to reduce the coefficient of friction between two moving parts by separating them with a thin film of oil or grease. The lubricant also cleans, cools and forms a seal.

Right Viscosity. Much has been written about how to choose the right viscosity or SAE number of the lubricating oil. This is no longer a problem for the operator in the field. All engine manufacturers specify the proper grade of oil to be used in their engines. The viscosity recommended by the engine manufacturer is the result of an attempt to compromise on the proper grade needed to carry out each of the four functions of the lubricating oil. In order to lubricate properly, the oil should be thin in order that it may be circulated rapidly by the oil pump. In order to clean, the oil should be viscous so that dirt particles will be held in suspension until removed by the filters. Oil, to cool efficiently, should be thin. The forming of a good seal between piston rings and cylinder liner is best provided by a viscous oil. Hence the attempt to compromise the needs of these four functions into one oil.

When to change oil in the engine crankcase is a subject which seems to have been overlooked by our filibustering friends in our national and state capitols. Most all engine manufacturers specify the number of days or hours of operation between oil changes. Not aware, in every case, of the engine application, its speed and load conditions, and the type of oil to be used, the manufacturer has set a figure well within the limits of safety. Most all of these figures can be extended by careful attention to the filter changes, cleanliness in storage and handling, and close observance for fuel or water dilution.

About the Author

JOHN A. BOATMAN, petroleum industry sales representative for George Engine Company, Inc., of New Orleans, La., was formerly division maintenance supervisor for Rowan Drilling Company. He received training in diesel engineering from the University of California, the Miami Naval Training Center, General Motors Institute and Armed Forces Institute. He was selected as instructor at the Odessa Engine School in 1949, during a leave of absence from the Rowan Drilling Company. A native Texan, Boatman served in the Navy aboard a patrol craft in the Mediterranean and was instructor at the diesel school of the Naval Training Center at Gulfport, Miss. Boatman's present assignment with George Engine Company, Inc., is confined primarily to the Gulf Coast area.

Several of the operators have provided field personnel with small portable oil testing kits which check for viscosity, acidity, asphalt content, water, bearing metal and dirt. Viscosity of the oil in a Diesel engine may decrease due to fuel or water dilution. In a gas engine, the viscosity usually increases due to distillation or burning of the lighter fractions in the oil. Acidity is formed by the combustion flame and is recognized as a greater cause of engine wear than friction.

Asphalt content in increasing amounts is an indication that the filters are becoming clogged and need to be changed. A change of filter elements always results in less asphalt content within a short time. Water in the oil is cause for immediate investigation. The mixing of water and oil forms an emulsion which will not support the bearing loads even under idling conditions. A small amount of wear metal is normal for all engines. However, a large amount of bearing metal indicates a serious failure is in the making.

Dirt is either brought into the engine through carelessness or it is manufactured by the engine through combustion. An engine which runs dirty is in need of repairs.

Lubricating Oils. There are two basic types of lubricating oils. Straight mineral oils are very seldom used in drilling engines today. Most all of the heavy duty gas and Diesel drilling engines now use a compounded or additive type oil. These additives are blended in the oil for different purposes. One additive may be for the purpose of detergency or better cleaning. Another may be to stabilize the viscosity under wide temperature variations. Still another may be to inhibit oxidation and corrosion. Earth or clay type filter elements tend to remove some types of additives from the oil and should not be used for that reason.

The customary oil pressure should be observed hourly and any change in pressure for a given engine speed and temperature should be cause for immediate investigation. Low oil pressure may be an indication of fuel or water dilution, low oil level in the crankcase or sump, faulty pressure gauge, leaking or broken oil line, faulty pressure regulating valve, worn oil pump gears or housing, or worn bearings. The pressure of the lube oil should exceed the pressure of the cooling water in the event that a leak occurs in the oil cooler.

Fuel, or the lack of it, is the source of more engine trouble than any other cause. Usually, failure of the fuel system will result in stopping of the engine with no serious damage. In rare cases, piston seizure may occur if the engine had been operating under a heavy load.

Dry fuel, such as natural gas, should be relatively free of chemical impurities. A gas scrubber should be used if sour gas is the only fuel available. The pressure should be regulated properly. If LPG is used as fuel, the evaporators and regulators should be in good working order. Spark-ignition engines should be stopped by turning the fuel off. Should the engine be stopped by turning off the ignition, a faulty regu-

Continued on page 134

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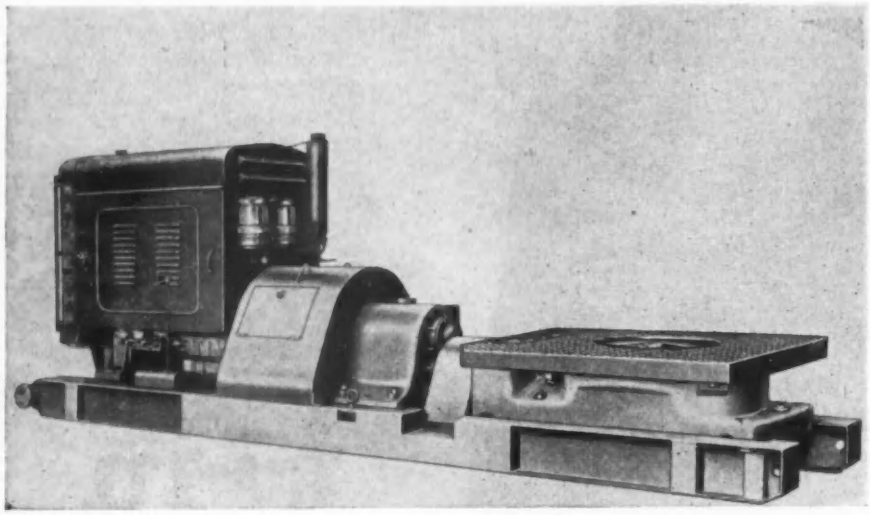

FIGURE 1

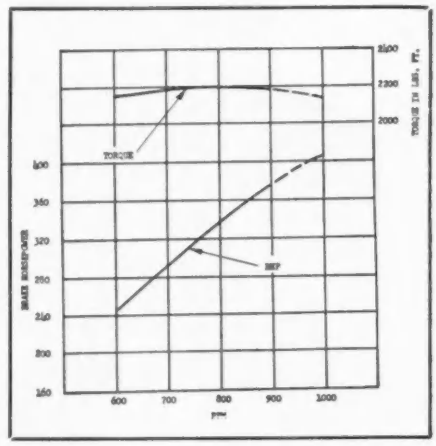

FIGURE 2

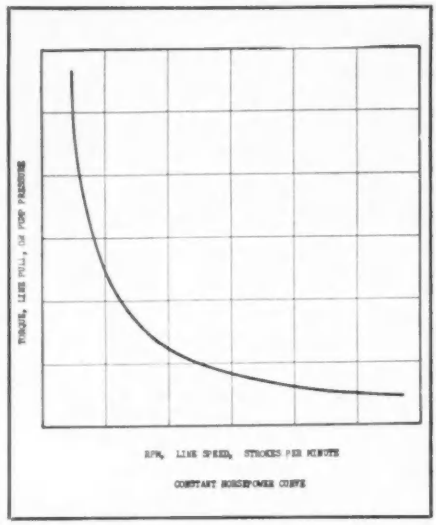

FIGURE 3

Power Transmission on Modern Rotary Rigs

Here's an analysis of the type drive to use—friction, fluid or electromagnetism—and the advantages of each.

By M. L. RIZZONE,
Oil Well Supply Division, U. S. Steel Corporation, Dallas

THE TRANSITION from steam power to internal combustion engine power on rotary drilling rigs has required considerable development work in the design of the power train elements. The friction clutch has made internal combustion engines practical but the use of fluid and electromagnetic drives has materially assisted in improving the characteristics of the power flow. As a result, better and fuller utilization of the installed power, smoother operation, and longer wear life of the component parts of the transmission system have been accomplished. An analysis of which type of drive to use, as well as the advantages of each, requires a study of the characteristics of power flow in a drilling rig using internal combustion engines.

A substantial period of time has elapsed since steam was the prime source of power in the drilling industry. Presently steam has been almost entirely supplanted by the modern internal combustion engine and many changes and improvements have taken place in the design concept of the drilling rig, and in particular the various elements which make up the power train from the prime mover to the drill string.

An analysis of all the improvements in the drilling rig would be too broad for any one study and it becomes necessary to confine ourselves for purposes of this discussion to con-

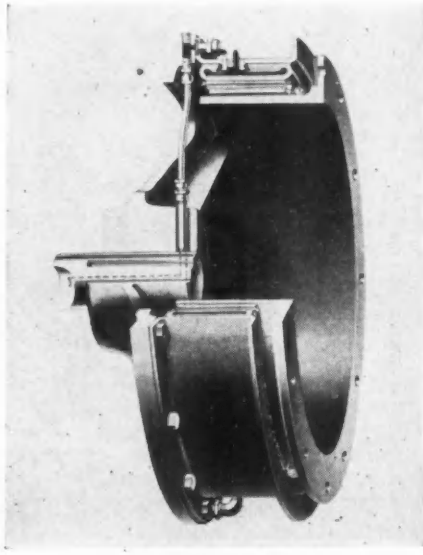

FIGURE 4

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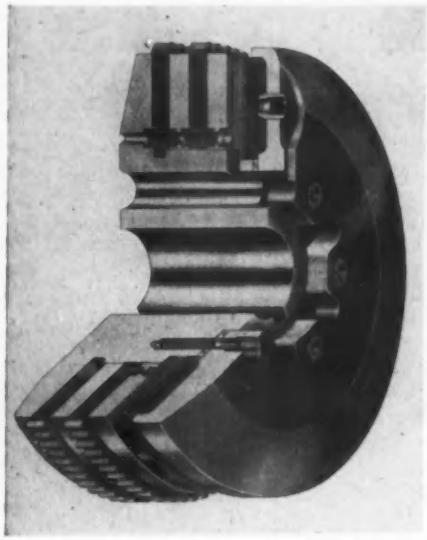

FIGURE 5

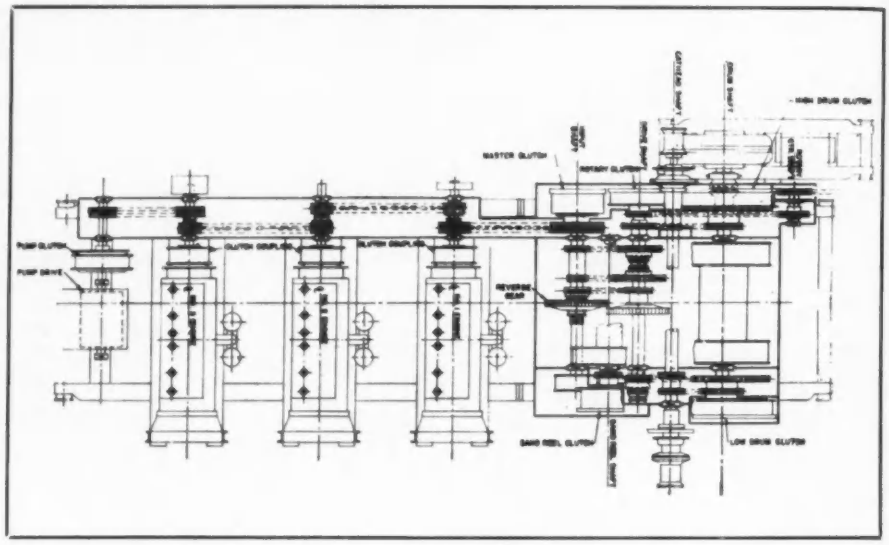

FIGURE 6

sideration of the friction clutch, the fluid coupling, the torque converter and the eddy-current coupling in the transmission of power in the modern rig.

Transmission Requirements. To properly evaluate the requirements of a power transmission, it is well to consider the equipment to be driven and the work to be performed by the transmitting medium. In a rotary drilling rig there are three basic power demands which must be satisfied:

- Power is required to turn the drill bit and pipe to cut the hole.
- Power is required to hoist the drill string for removal and replacement of the worn bit.
- Power is required to pump drilling fluid which is necessary to remove the cuttings from the hole, as well as to wash, clean, lubricate and cool the drill bit.

The amount of power required to turn the rotary machine is difficult to evaluate. Approximately 2 horsepower per revolution per minute of the rotary table should be provided. Power to turn the rotary machine is usually provided in one of two ways, either it is taken from the power installed on the compound or from an independent prime mover. When an independent rotary drive is desired, a drilling unit such as shown in Figure 1 is used. It consists of a prime mover to which is installed a torque converter and connected through a flexible coupling to a geared transmission which is in turn connected to the rotary pinion shaft.

The amount of power installed on the compound to drive the drawworks is usually in the vicinity of 1 HP for each 10 feet of 4½-inch drill pipe. This should permit hoisting a drill string at the rated depth with a velocity of about 100 feet per minute off bottom. Compounds are generally provided with one or two power take-offs to drive the drilling pumps. These pumps are usually of the duplex double acting reciprocating type and are available in various sizes. In hard rock drilling less pump horsepower is required than in areas where softer formations are frequent. In the latter areas, large pumps are used to assist substantially in the drilling work, that is, the work required to cut the hole. Operators vary widely in their ideas on pump requirements with applications varying anywhere from 50 percent to 150 percent of the required hoisting power.

The amount of power installed on a drilling rig should allow for the driving of auxiliaries such as a generator for the rig lighting system and an air compressor for the air clutches and controls, however this is not usually a very appreciable amount. A maximum of 30 to 40 HP is generally sufficient.

Internal Combustion Engine. It is well to examine a typical performance curve of an oil field internal combustion engine (Figure 2). It may be quickly noticed that the torque output is fairly constant over the speed range of the engine. As a result the horsepower increases almost proportionately over the speed range.

The operation of any internal combustion engine is limited to a specified speed range and in this case the engine is usually governed at 900 RPM and idles at about 400 RPM, therefore, its use must take this into account.

The output torque of the engine is maximum at a point less than the governed speed and when maximum torque is required, the engine slows down to this speed and continues to reduce in speed if the torque demand

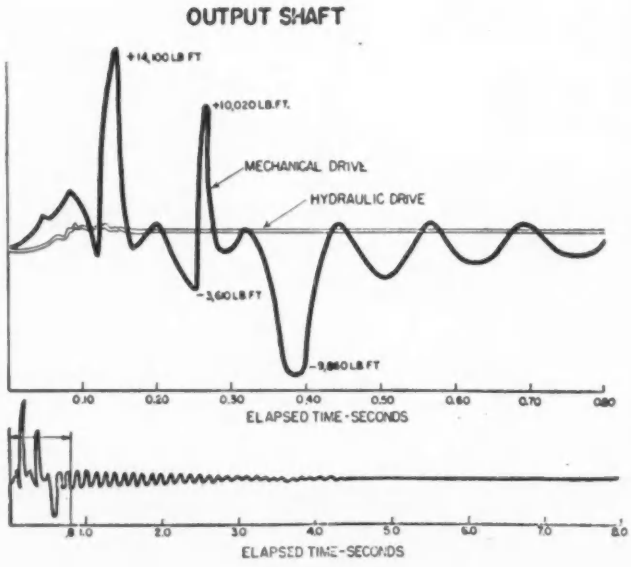

FIGURE 7

is too great causing the engine to lug. This, to say the least, is injurious to any engine and sustained operation under these conditions cannot be permitted.

Therefore, when a load is started and an accelerating torque is required, the maximum torque of the engine, multiplied if necessary through a suitable transmission, is available to pick up the load. When the load is in motion the torque demand reduces and the engine comes up to speed delivering maximum horsepower.

When loads are such that a variable torque demand exists during the work cycle, the engine torque must be sufficient to overcome the maximum torque demand, or a transmission capable of varying the delivered torque is required. In a rotary drilling rig the rotary drive is usually set for some desired rotating speed.

The torque value is not a constant and may vary considerably. When hoisting drill pipe, frequent starts are encountered and a substantial accelerating torque must be available to start the pipe string and other elements from rest and continue the pull at suitable rates of speed. At the same time the load is constantly being reduced as each stand is removed. In the case of driving the mud pumps the requirements of the pump are not constant due to the effect of the crank connecting rod mechanism.

Constant HP Curve. At this point let us briefly review the basic relationship between horsepower, torque and speed:

$$HP = \frac{\text{Torque x Speed}}{5250}$$

in which torque is given in foot pounds and speed in revolutions per minute. It is obvious that the horsepower is the product of torque and speed. For a constant HP, torque and speed are so related that an increase in one necessitates a reduction in the other.

When this relationship is plotted on a graph (Figure 3) the curve is an equilateral hyperbola which is the characteristic curve of the product of two variables maintained constant. Therefore, we call this the constant horsepower curve. The ordinate or vertical value of the graph is usually torque, or synonymously, line-pull or pump pressure. The abscissa or horizontal value is RPM, or synonymously, line-speed or pump strokes per minute.

When we think of the maximum utilization of the installed power, we are desirous of using the prime movers at their rated speed and delivering their rated horsepower. In this manner maximum work is accomplished. Any operating condition or equipment limitation which prevents maximum utilization raises the net cost of the work performed. It thereupon requires that the design of equipment be such as will yield the practical maximum to the operator.

We have just said that the internal combustion engine had a fairly constant output torque through its speed range and its maximum horsepower delivery at the highest speed. It then behooves us to operate the engine as much as possible at the highest permissible speed. For continuous operation at constant speed, the engine manufacturer will stipulate this speed and will also stipulate what higher speeds may be attained intermittently.

The engine manufacturer will also suggest limits on horsepower demand upon the engine both for continuous and intermittent service. The usual application of engines on a drilling rig requires that they be available for the intermittent hoisting operation as well as for continuous pump and rotary operation. In this case they are governed at a speed which is limited to continuous duty. On very few rigs where the drawworks is powered with engines for hoisting only, higher governed speeds are permitted.

Friction Clutch. The friction clutch has made possible the modern power rig as it is known today. By providing the coupling element between the engine and the driven equipment such as is found on the rotary drilling rig, it is possible to utilize the internal combustion engine to pick up loads and transfer power from engine to equipment. It provides the medium which allows the rotating engine, the speed of which cannot be allowed to reduce below a certain amount, to maintain operation and engage a non-rotating deadload and by slippage of the clutch provide a means of transferring torque in an amount sufficient to accelerate the driven equipment. After the driven equipment is brought up to the speed of the engine and no slippage exists, the clutch becomes a coupling in the power train.

Friction clutches used on drilling rigs are generally one of two types. Figure 4 shows a typical constricting type which consists of a flexible tube vulcanized to a steel rim. Friction shoes are mounted to the inner diameter of the tube. The design arrangement of this clutch requires that the element be mounted to a carrier spider. The clutch expands with air admitted into the tube which causes it to constrict about a clutch drum.

The disc type clutch is similar to the very well known automotive type and is usually air engaged on present oil field models. Figure 5 shows a typical air operated disc clutch. Additional torque capacity can be supplied by using more than one friction plate, however the use of more than three friction plates makes release difficult, causing these clutches to have a tendency to drag. There are many other versions of these types, however we shall not dwell upon them here. Their function however is basically the same as we have described.

Analysis of Power Flow. A typical drawworks power flow layout is shown in Figure 6. Considering first the driving of the rotary, it is seen that the power from the prime mover is transmitted through chain drives from the compound through the drawworks three-speed transmission through the engaging friction clutch to the rotary jack shaft and to the rotary pinion shaft. The drive system to the rotary clutch is turning at engine speed. Beyond the rotary clutch to the rotary table the system is not in motion. When the rotary clutch is engaged, the friction clutch slips until the rotary turns at the same speed of the prime mover system. At the instant of engagement and prior to the beginning of rotation of the rotary, all the slack in the chains is first taken up and as the transmitted torque is applied, the shafting and chains deform. Deformation continues until the elastic energy is absorbed in the chain and shafting and reacts to overcome the static rotary load with a sufficient accelerating torque.

If the friction clutch is suddenly engaged, the result is a sudden accumulation of energy. The natural inertia of the static system on the one hand, is opposed to the rotating inertia of the driving system on the other. The greater this difference the greater is the energy to be absorbed and hence the greater are the stresses in the various mechanical components. Thus it is desirable to engage

the friction clutch softly by permitting the clutch to slip into engagement.

The clutch must not be permitted to slip excessively as the friction work which is attributable to the energy not transmitted during the process of engagement is transformed into heat and is detrimental to the clutch. This causes wear on the clutch linings and warpage of the clutch elements and hence should be reduced as much as possible. Engagement of the clutch at high engine speeds or when the speed differential is great, aggravates the conditions we have just described and very high shock stresses can be induced in the system. This manner of engagement is commonly known as "running into a load."

When the drill string is picked up in the hoisting operation much the same process is involved. Referring to the power flow layout of the rig, we see that the engines are compounded together with chain drives combining the output of the engines. The input drive to the drawworks carries the power into the drawworks transmission through a selected speed and thence into the drum through a drum clutch.

The rotating drum winds up and the wire line which causes the traveling block and hook to rise hoisting the drill string. The drum clutch is the connecting element. When the elevators have been latched to the drill pipe below the tool joint, the drum clutch is engaged. At this point the driller opens the throttle of the engines wide in order to accelerate the reciprocating masses of the engines and the rotating elements to the drum clutch to the speed at which the engines deliver maximum torque. Simultaneously the engaging friction clutch transmits torque to accelerate the system from the drum clutch to the drill pipe which is at rest.

The chain slack and the clearance between the tool joint and the elevators is first taken up. Then the chains, shafts, wire line, hook spring and all the load carrying elements are deformed absorbing the energy of the transmitted torque and when the energy is sufficient, the pull developed upon the drill pipe causes it to be accelerated from rest and put into motion.

It is easy to visualize the role of the drum friction clutch especially of the high speed drum clutch in which case there is greater relative rotation during its engagement because of its higher rotating speed. These clutches must be capable of absorbing and dissipating great quantities of heat which is generated during engagement, considering also that the hoisting clutch is operated once every 60 to 120 seconds to pick up the drill string during the hoisting cycle.

When pulling pipe through an open hole and "tight" hole conditions are encountered, the low drum clutch is frequently called upon to hoist the load after the load has been stopped by the drum brakes during the pulling cycle. At this time no slack exists in the system from the drum to the drill pipe to aid in the engagement. Under these conditions the low drum clutch is subjected to extreme heat conditions especially if several consecutive engagements are required.

Consider the case of the pump drive. The power flow layout shows the engines compounded together and, through a friction clutch, power is transmitted to the pump drive which is most frequently a large multiple V-belt drive to the pump pinion shaft. In the same manner as we have just described the pump is set in motion upon the engagement of the pump clutch.

Magnitude of Shock Loads. When a friction clutch is engaged to pick up a load, a certain amount of shock load as we have discussed, is imposed upon the power train. The magnitude of these loads would vary more or less directly with the manner of engagement of the clutch. Careless operators can impose very severe loads by sudden clutch engagements. By controlling the air pressure delivered to the clutch with a metering type control valve or providing a suitable flow restriction choke in the air line to the clutch, the engagement may be made smoothly.

Figure 7 very strikingly demonstrates the magnitude of the momentary loads that are imposed upon the power train during the engagement of a friction clutch. These are the loads which induce very high stresses in the various members of the power train and the more frequent their occurrence the shorter the wear life of all the component parts. It has been found that the magnitude of these stresses is as much as ten times the normal operating stress.

—End Part I

Protecting Engines

Continued from page 126

lator may admit fuel into the engine during the down time and cause a serious explosion when started again.

The fuel system in a diesel engine can be the source of much trouble. Because of the very small clearance between the plunger and bushing of the fuel pumps, the least amount of dirt or water in the fuel can cause serious trouble. In fact, the essence of trouble-free diesel engine operation lies in cleanliness of the fuel.

The fuel tanks should be checked for water each tour. This is especially true of barge rigs where the fuel bunkers lie below the water level of the canal or lake. A water trap should be provided in the fuel line between the fuel tanks and the engines. Washdown fuel for general rig cleaning should be drawn from this water trap, assuring its periodic stripping. In any event, the fuel tanks should be checked for the presence of water immediately following the receiving of bulk fuel. Another man's mistake or carelessness could cause complete power failure during drilling operations, resulting in stuck drill pipe.

Operating Records. Accurate daily operating records should be kept at the rig. The engine report may show several readings for temperatures, pressures, speed, fuel consumed and lube oil consumed. However, the most vital information which will concern the maintenance department is the number of hours run and the lube oil and fuel oil consumption. From these figures, plus periodic cylinder compression readings, the need for minor or major overhaul will become evident to the mechanic. A folder should be provided for each engine and a record of major repairs should be posted on this machinery operating history sheet.

Much of the success for good engine maintenance can be credited to only a few basic requirements. Schooling contributes to the mechanic's knowledge. Experience develops his skill. Close supervision of the work performed will save dollars and time. Finally, the owner must provide the proper working tools and the best possible working conditions under the circumstances. Men, as well as machines, must be considered in the overall purpose of the job to be done.—**The End.**

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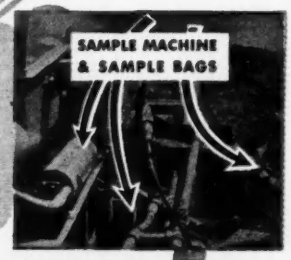
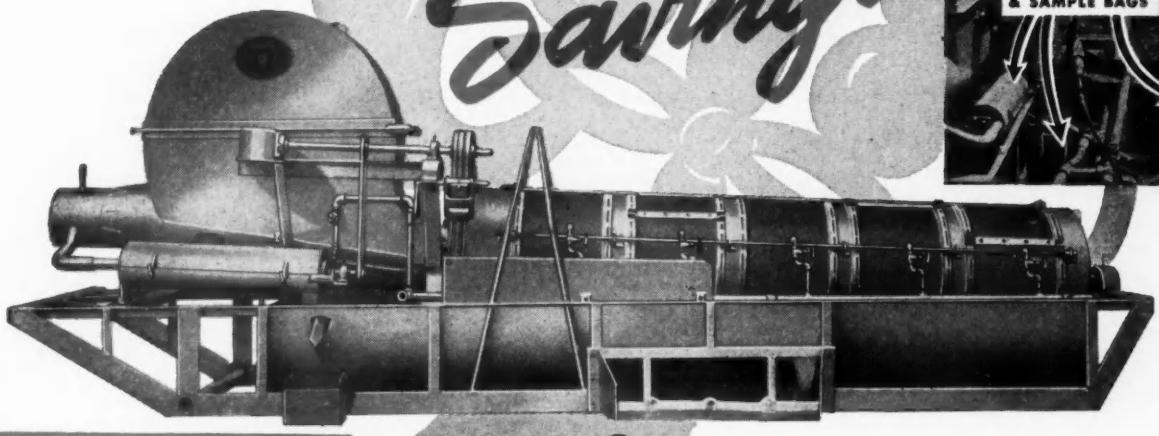
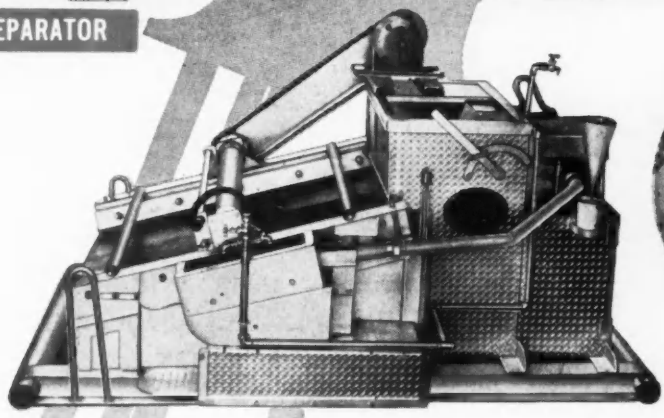
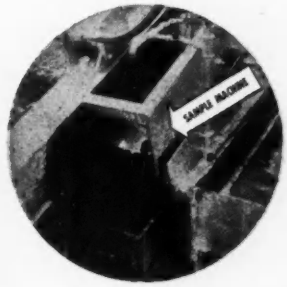




ROTATING SHALE SEPARATOR





VIBRATING SHALE SHAKER

Either one of the above machines will offer the drilling contractor bigger savings in drilling time and drilling costs. The Thompson Shale Separator and Shale Shaker are outstanding for ECONOMICAL OPERATION and for PROVEN PERFORMANCE. They do an excellent job of removing destructive shale and abrasives from mud and Thompson's famous SAMPLE MACHINE (Standard Equipment) gives you more information about drilling formations through highly accurate samples. For more complete information — WRITE THOMPSON — TODAY!

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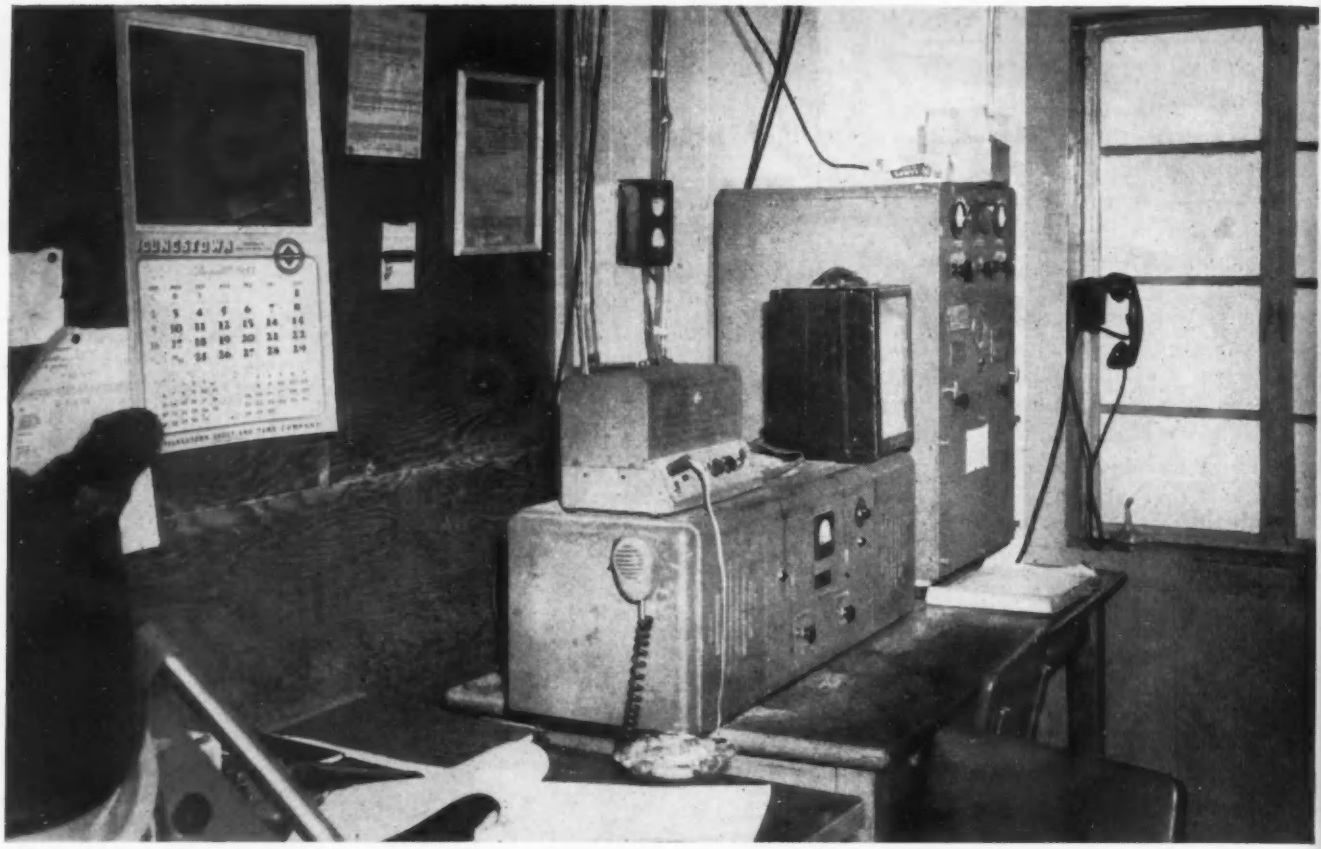
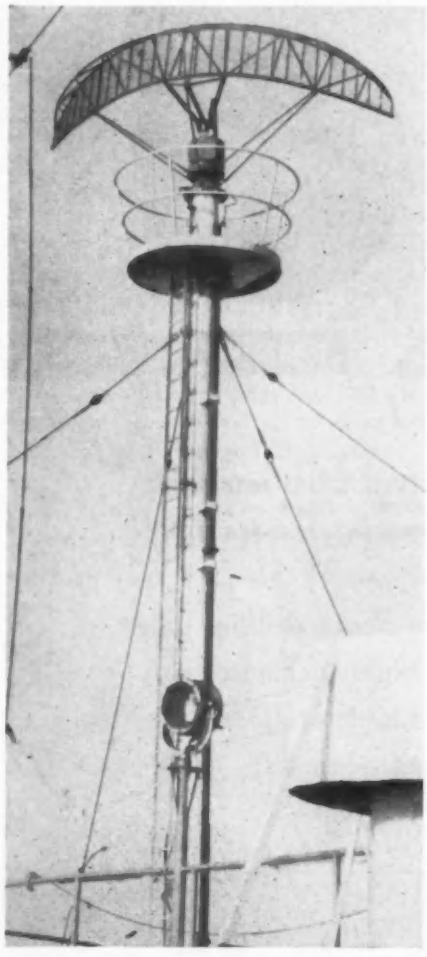


RADIO-RADAR ROOM on Kerr-McGee's Rig 40. Radar set at left.



RADAR TOWER

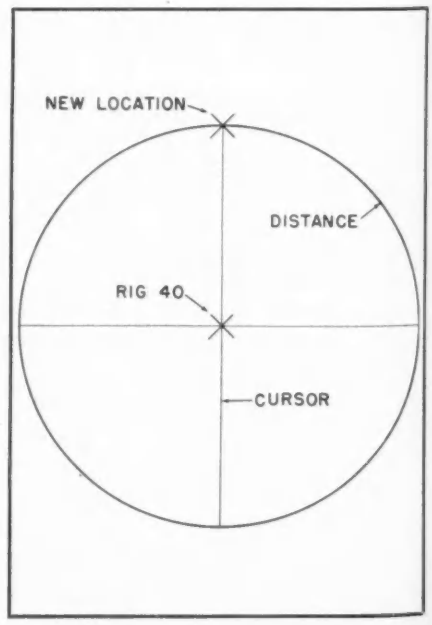
Talking Drilling Barges Into Position . . .

. . . by using radar and radio. It's saving time and money for Kerr-McGee in the Breton Sound field off the coast of Louisiana.

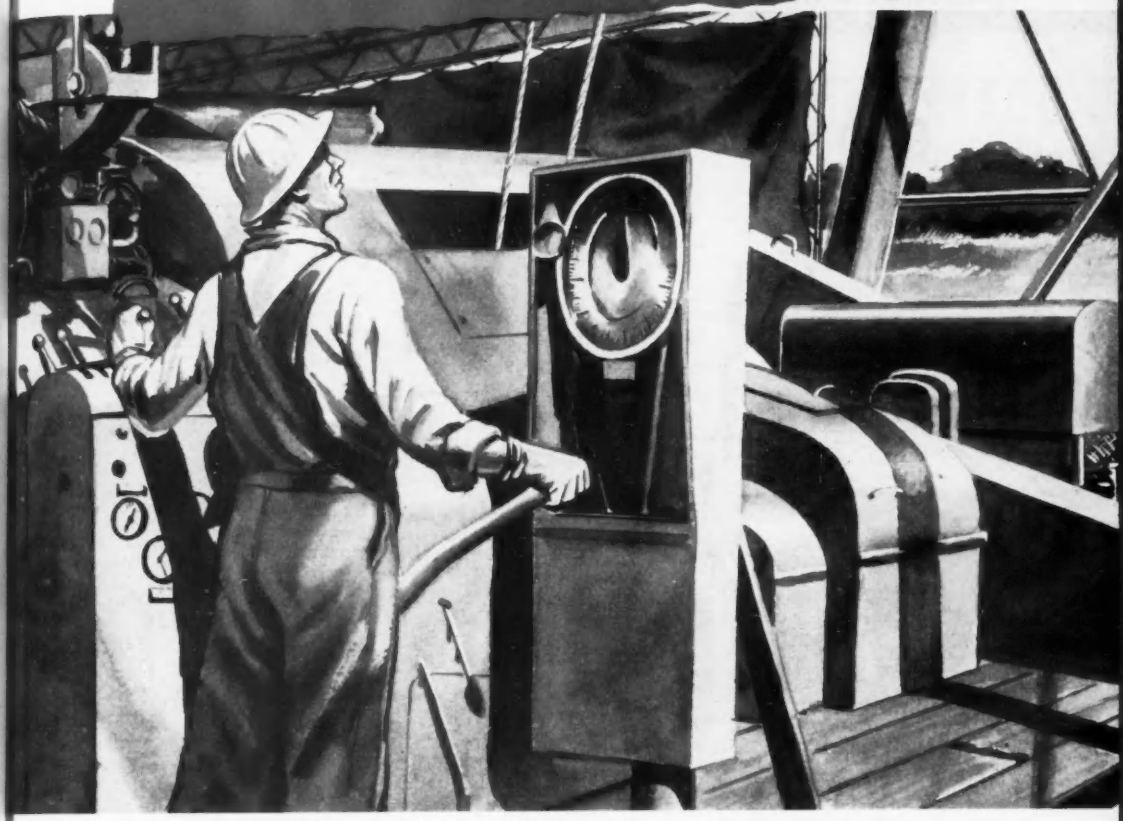
KERR-McGEE Oil Industries Inc., saves time and money by using radar and radio to spot locations for its submersible drilling barge, operating in the Breton Sound field off the coast of Louisiana.

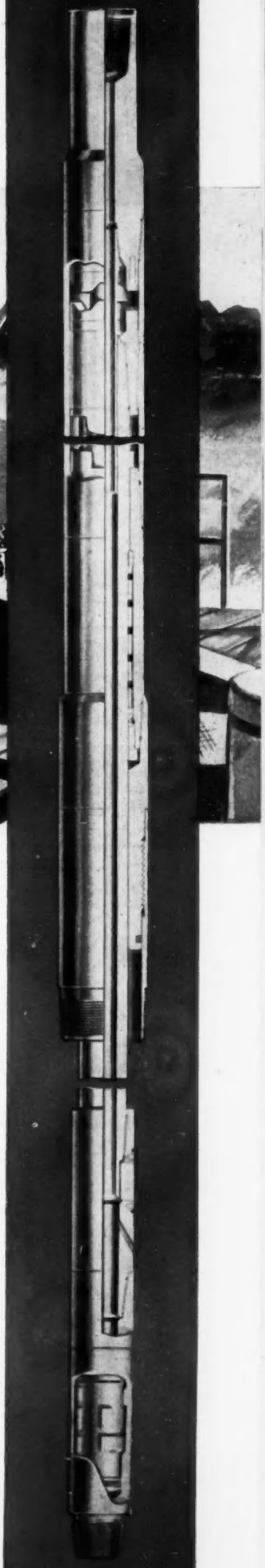
Used only for strata hole drilling, the procedure is as follows: The toolpusher is ordered to move the barge to a certain point. He adjusts the radarscope's cursor line, indicating direction, and the distance marker (see drawing) so that the converging point marks the spot of the proposed location.

A service boat equipped with two-way radio goes out with a buoy in tow. The toolpusher at the radar set "talks" the boat to the convergence of the cursor and distance lines. The buoy is dropped.



Safer Recovery of Stuck Pipe with ONE ROUND TRIP





The Homco Washover Back-Off Tool

. . . is screwed into the top of the wash pipe, the drill pipe is then made up and run in the hole. The stuck pipe is washed over until the wash pipe approaches its limit; a threaded pin on the inner mandrel of the HOMCO Washover Back-Off Tool sets down on the tool joint box of the fish. Weight is applied with right-hand torque and the tool is made up into the fish.

Weight is picked up engaging two clutches in the HOMCO Washover Back-Off Tool allowing right-hand torque to make up tightly the pin and box. After the shear-pin in the hook-type safety joint has been sheared, the kelly is removed from the string and a single screwed in its place. The string is then lowered and the safety joint is re-engaged.

The HOMCO String Shot and Free Point Indicator is run into the hole to determine the lowest free point of the fish—tension is taken in the string and left-hand torque applied—the shot is fired and the "fish" spins loose. The string is then raised to the surface until the top of the wash pipe appears at the rig floor and with the wash pipe hanging in the slips, the tool is unscrewed and the fish stripped from the wash pipe.

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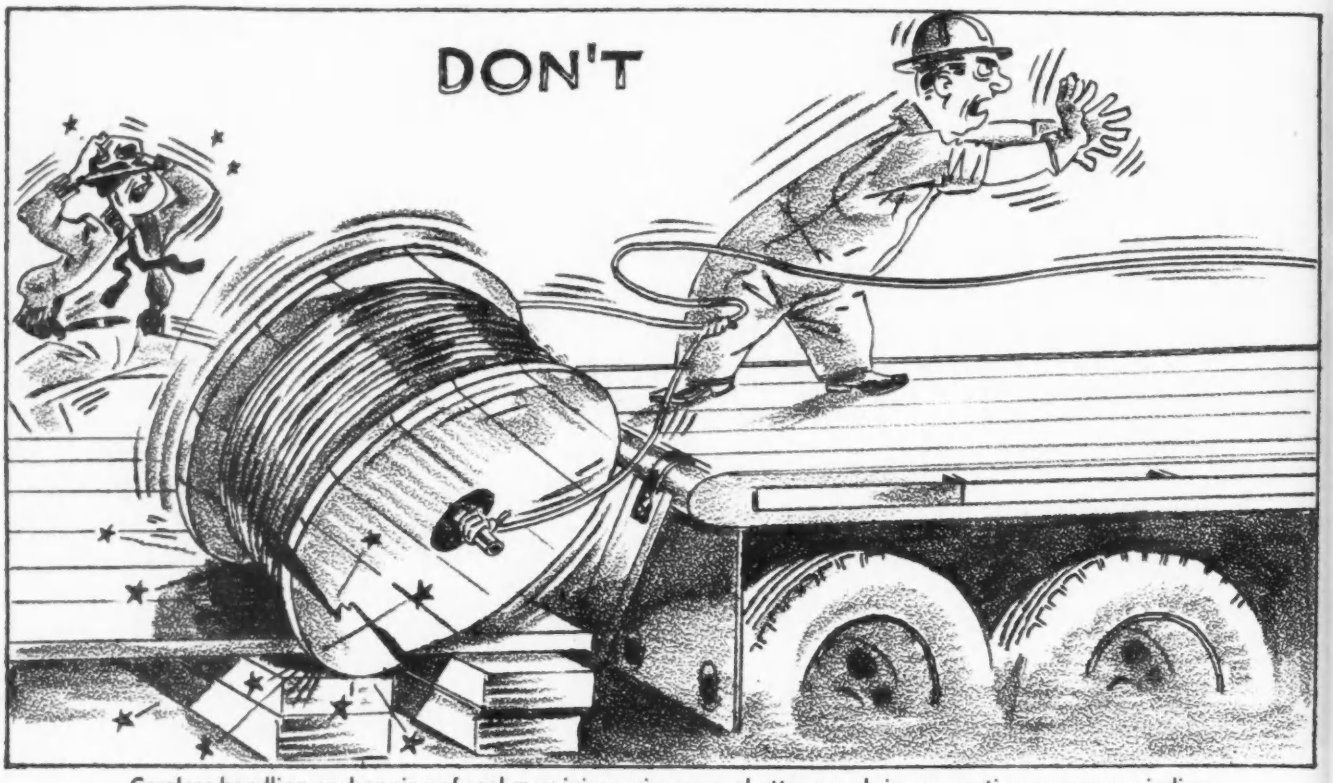
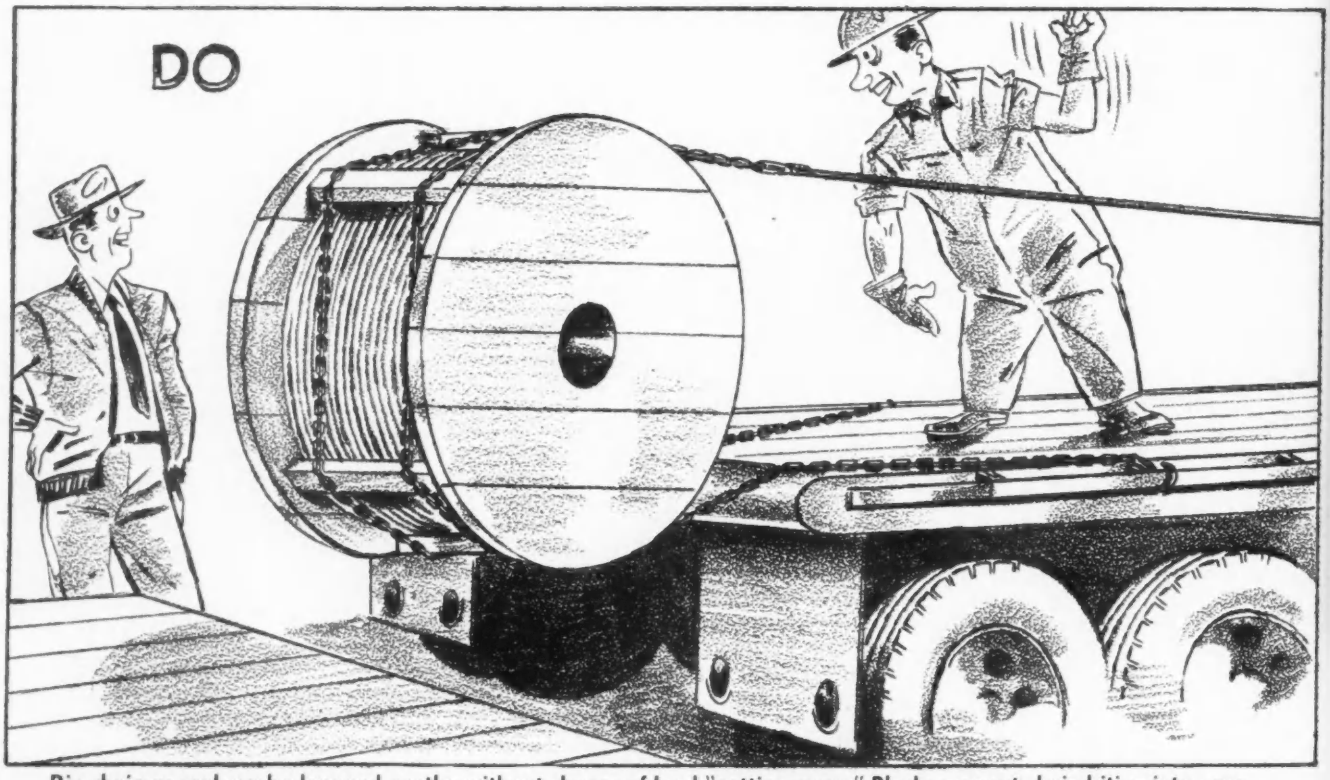


Careless handling or dropping of reel may injure wire rope; shatter spool rim preventing proper unwinding.



Rig chain so reel can be lowered gently, without chance of load "getting away." Blocks prevent chain biting into rope.

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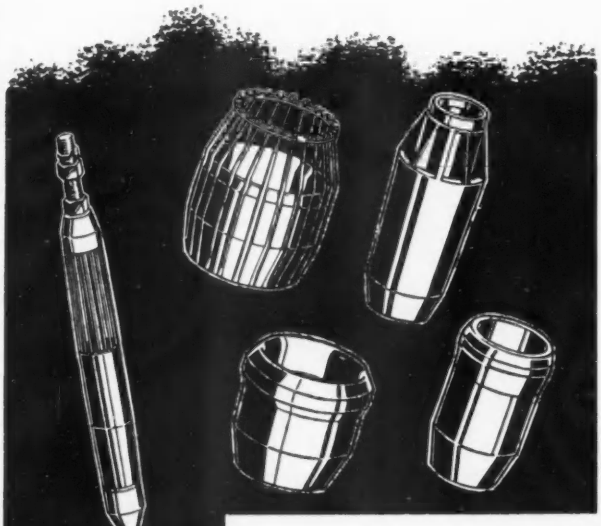

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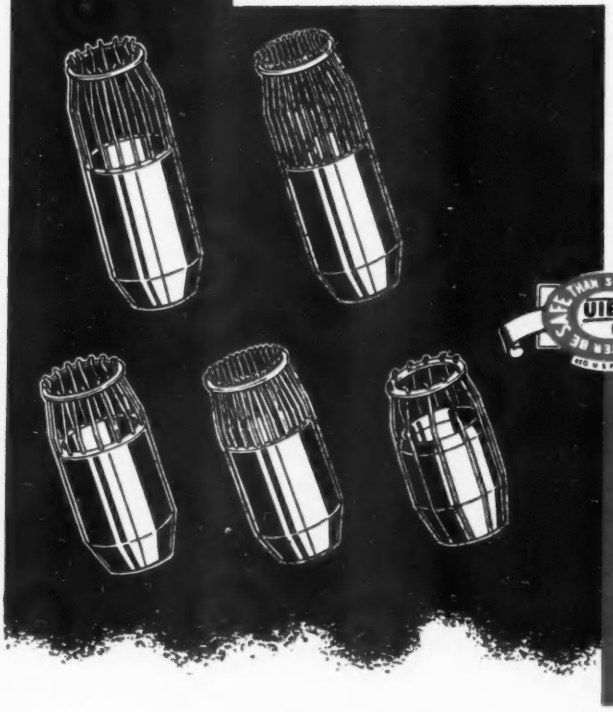

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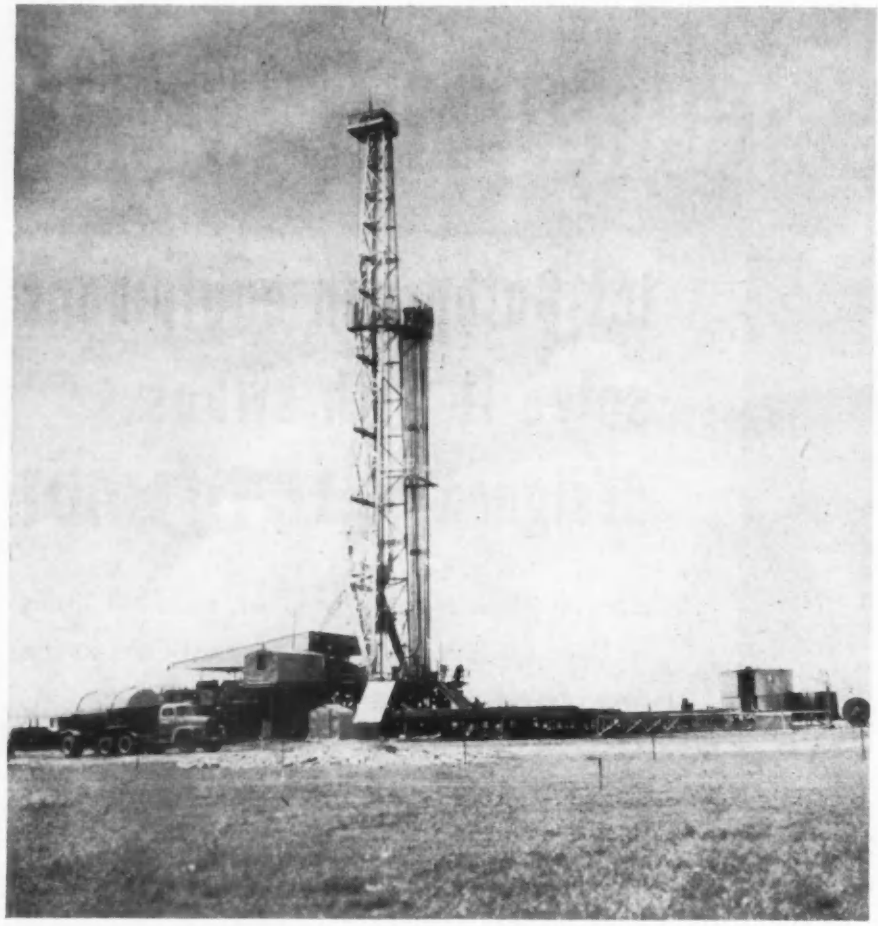

THE PRIME MOTIVE of the contracting business is "simply to convert some form of fabricated pig iron into a profit through means of technical know-how."

A Banker Looks at the Contracting Business

From a credit-eye view, the two big weaknesses are (1) an insatiable desire for more equipment and (2) an inadequate accounting system.

By EUGENE McELVANEY, Senior Vice President,
First National Bank in Dallas

IF ONE WERE to ask the leading bank credit men of the country what general category of credit extension represented the most hazardous risk, they would perhaps agree without hesitation on the contracting business. If an analysis were made of all the charged off loans, or loans which ran into trouble, among banks over the country relating to any particular type of business risk there would probably be a larger percentage of such loans to contractors than any other one type of business venture.

Your awareness of the truth of this assertion might have a very salutary effect on the conduct of your business. Not only the oil well contracting business—but the contracting business in general, whether it has to do with the erection of a building, the construction of a dam, the laying of a pipe line, the paving of a highway, or the simple excavation of earth.

There are inherent risks in this type of enterprise not associated with any other kind of human business endeavor. The reasons are not difficult to discover. By comparison consider for a moment the facts involved in the extension of credit to any number of other types of business. The cotton merchant for instance. Here the commodity itself offers almost automatically the means of liquidation, as well as the margin of safety. Under conservative hedging requirements even the market hazard is removed and the risk is reduced to a minimum.

The same is true of the grain business, the flour or feed or cotton oil mill. The merchant has inventory on his shelves or accounts on his books which at least most of the time may be counted as quick assets available for almost automatic liquidation. Even in the case of a manufacturer, involving as it does a conversion of raw materials into saleable products, the risk is approached within the fairly narrow cycle of the tried and proven conversion process itself—so that in any event raw materials or saleable inventory at either end represent tangible liquid assets, to say nothing of the constant accumulation of accounts receivable, as a source of debt liquidation.

Even the physical asset of real estate frequently offers a solid backlog of collateral value to the manufacturer. Even what was once regarded as the most speculative of all risks—oil in the ground—under modern methods of appraisal and lending technique has become one of the safest and most liquid of all forms of banking collateral.

The Business. Consider the total lack of these inherent elements of strength and liquidity in the contracting business. Here the prime motive is simply to convert some form of fabricated pig iron into a profit through means of a technical know-how. Perhaps it's not too unlike the business of farming except that nature is more often on the side of the farmer and on the other hand usually arrayed in all her obstruse and obstructive ways against the efforts of the contractor. The farmer can at least eat and be sustained by the products of his efforts, as meager as they may be.

The contractor may starve till the job is finished and a final accounting reveals a profit or a loss. His business permits little margin for error. Labor

and expendable materials can't be retrieved until hopelessly sunk in the job to final conclusion. Nobody is going to buy and completely pay for them while they are in process. Unless the job is finished according to specifications the retainage or usual margin of profit is in constant jeopardy. There are few self liquidating aspects of his business. His is a constant struggle with machines and the elements. His only inventory is whatever cash of his own he can supply to the job, his brains and his brawn, and sometimes, his nerve. His machinery and tools in trade have value only in his hands and his hands must be expert. These things are said about the contracting business not in a depreciating fashion but because they reflect the almost universal thinking of bankers everywhere with respect to that type of risk. If those things be true of the contracting business generally they are all the more pointedly applicable to the drilling contracting business, with even more emphasis on the hazardous character of every contract you undertake. Not hazards from the standpoint of physical safety, although in the drilling contracting business that's a worthwhile subject of its own. Reference is made to the vast difficulties that stand in the way of converting cast iron and fabricated steel into what is termed spendable profits, to say nothing of capturing enough depreciation to keep pace with the wear and tear on tools.

Capital Outlay Big. The business of modern drilling contracting calls today for the greatest capital outlay per horsepower employed, of possibly any mechanical manipulation in history. In calling for the penetration of ever tougher formations at ever greater depths, at ever greater speeds, it demands a concentration of intricate and complicated equipment vastly beyond the requirements, in both cost and maintenance and operation, of the average surface contractor.

From the spudding in to total contract depth it subjects that equipment to the constant uncertainty of stresses and strains that cannot always be anticipated. It must employ its greatest power at the greatest distance from its objective, demanding constantly a delicate and exacting

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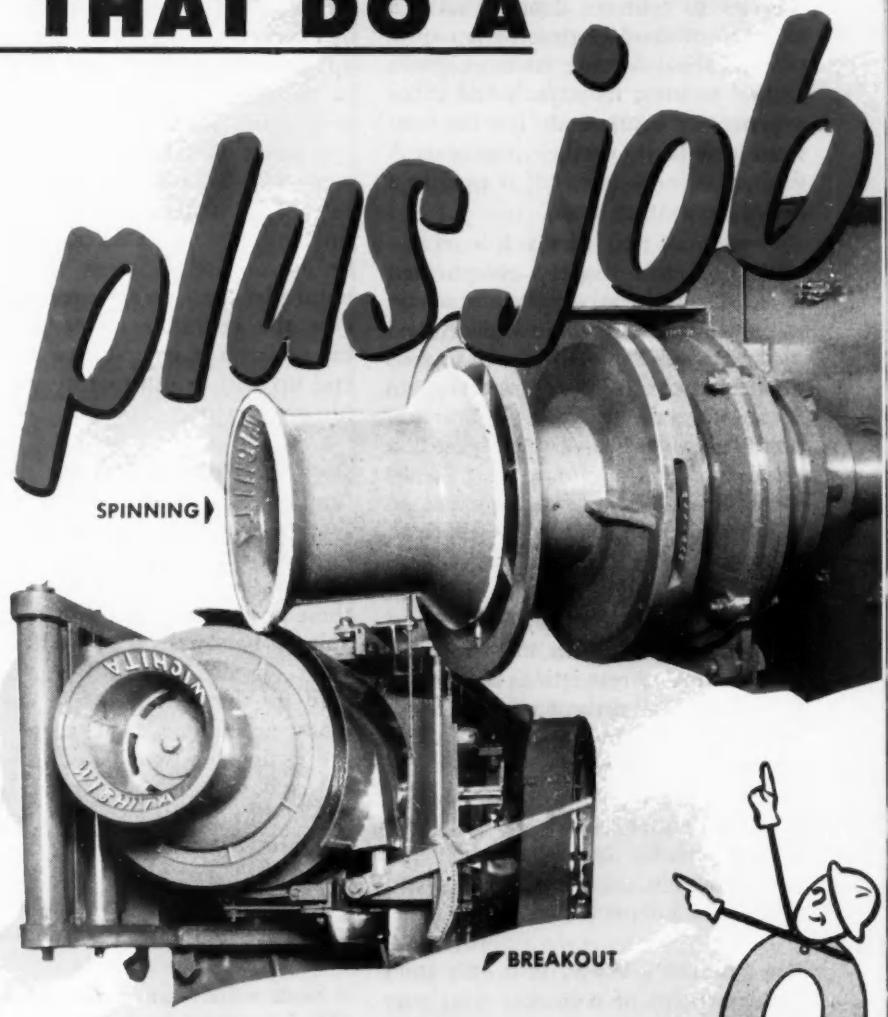

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skill that is an absolute requisite for successful drilling. It must assume all the risk to contract depth. Unlike a building or road contractor it enjoys no periodical income from estimates earned to meet its payroll and other expenses or compensate for the constant risk to its costly equipment. A fishing job or a twist off is usually a noncompensatory loss.

Despite all that science has accomplished in this highly complicated and risky business, despite the amazing technical know-how developed to make hole to almost miraculous depths—the contractor's ability to accomplish all this at a satisfactory profit to himself is probably still a bigger problem than most of the technical difficulties faced at this and all the further meetings of A. A. O. D. C.

Perhaps it is a pretty good thing, that even as far as the government went at one time in trying to hamstring business with a lot of foolish and ineffective restrictions and directives under our present system of free enterprise, any one in this country is still privileged under the law to go broke if he chooses or knows no better. The degree of success or failure of any private enterprise still rests pretty largely on business acumen and sound judgment.

The Banker's View. It is only from the viewpoint of a banker who may have a little wider perspective that these observations with respect to a few apparent fundamental weaknesses in the drilling business may be, if not helpful, at least interesting. Perhaps the very evolutionary development by which the average drilling contractor graduates into actual ownership from an apprenticeship of roustabout or toolpusher accounts for the lack of some essential ingredients for the conduct of a successful business. It has undoubtedly overemphasized the technical aspects of getting a hole down as the only requisite for successful drilling.

Many an ambitious driller with a wealth of experience and technical know-how has attempted to match his skill with practically no capital and a borrowed rig. Here in his more realistic role as owner and master he found that meeting a payroll was even tougher than a fishing job. He learned the hard way some of the facts of life more closely related to dollars and debts than to the loss of circulation. Certainly the successful drilling contractor has not only to apply technical skill and knowledge in the highest degree, but if he is to produce an actual profit from his operations he must be able to achieve conservative and constantly balanced ratios of debt to capital and working funds to volume. In no other way can he absorb the inherent risks of his naturally hazardous enterprise, survive the uncertainties of employing his tools on a competitive basis and end up with a satisfactory return on his investment.

Owner's Equity. Perhaps the most fundamental consideration, both for the basis of sound credit as well as the successful conduct of any business, is the owner's equity. Basically there is no substitute for some reasonable proportion of the capital requirements of any business being contributed by the owner. While there are many acceptable variations of the proportion, no reliable source either of fixed or working capital is open to any business enterprise unless it be fortified to some extent by an outlay of cash or tangible or marketable assets contributed by the owner, commensurate with the volume and risk of the business.

Such minimum requirements are not for the sole protection of the creditors, but should provide a safeguard for the stability of the business itself against inevitable contingencies. Many a business undertaking, well conceived in principle and founded on perfectly logical profit possibilities, has succumbed for want of adequate private initial capital. No measure of favorable prospects, no intangible value attaching to skill and technical know-how, regardless of how essential these may be; no appreciation of assets above their intrinsic or readily saleable value—none of these or similar intangibles offer a substitute for owner's capital to cover owner's risk.

One might well point out numerous examples of outstandingly successful drilling concerns which started from scratch with an extremely small margin of initial capital and which, therefore, seem to belie the principles just enunciated. Yet good fortune and the confidence of friends often spared these pioneering enterprises the unfortunate contingencies which, had they occurred, might easily have wiped them out. Even though their equity was paper thin, yet through persistence and faith and deep-rooted economies enforced by necessity, they were able to improve and conserve their capital position until they were soundly established. Certainly from that point they gauged their future expansion in terms of a sound equity position. They had to if they survived.

Desire for Equipment. That brings up possibly one of the cardinal weaknesses in the drilling contracting business and one most often leading to difficulty—an apparent insatiable desire for additional equipment. It is often said that every man, once a ranch owner, wants to buy all the land surrounding his original holdings in a process ad infinitum. To no group of people on the American business scene is that philosophy of acquisition apparently more applicable than to oil well drilling contractors. Many a contractor seems to go rig crazy—a disease which benumbs his sense of proportion, blinds his conception of actual need, and, most unfortunate of all, overstretches his financial ability not only to comfortably absorb the new acquisitions but to employ them profitably against a background of dissipated equity and all the attendant risks and burdens every drilling rig involves.

Some contractors seem to follow a theory that if four rigs will produce a given profit, eight rigs, regardless of the basis on which acquired, will produce exactly twice as much. The pursuit of this mathematical fallacy in business, and particularly in the drilling business, can lead to ultimate disaster. Size, per se, does not produce profits, and the expansion of any business beyond (1) its capacity to absorb additional fixed capital outlays and (2) the proven need for such expansion, is a fanciful delusion which brings many a business to grief.

Let it be said here again that no undertaking today is so exacting in its equipment requirements as that of a drilling contractor. Efficiency and safety are prime factors and in no field is fully adequate and up-to-date equipment more essential to successful and profitable operation. Certainly one up-to-date rig of versatile

capacity, meticulously maintained and expertly fitted with all modern operative devices and auxiliary equipment is of far greater value in profit potentiality than several outmoded rigs of junk quality.

One has only to visualize the ramifications of business procedure set in motion by the operation of a single drilling unit—in the realm of law, engineering, accounting, personnel, purchasing, banking, administration—to know that one such unit is a business all to itself. With modern, heavy-duty rigs the capital outlay is not only greatly increased, but all attendant costs, as well as risks and responsibilities are likewise proportionately multiplied.

Accordingly, the addition of every rig to a contractor's outlay is a major undertaking, and with present day costs of heavy-duty rigs every contractor should look upon any new addition as just that—a major undertaking. The promise of additional work which might be available for a certain type rig may be a valid consideration for the purchase of more equipment, but it is not the only consideration. More important are such realistic factors as the amount of debt already owed on presently owned equipment, the amount of working capital in hand, and the proven capacity of the business to undertake the added commitment, to employ it at a satisfactory profit.

Indebtedness is much easier to create than to liquidate. Assets are flexible in value, reflecting given economic conditions. A stacked rig may be worth only a fraction of its intrinsic value but the debt against it is valued at a hundred cents on the dollar. The difference is an inescapable charge against the owner's equity. And so many rigs can be burdens as well as assets, a circumstance which greatly reduces their value as collateral.

While under certain conditions bank credit is often made available against rigs as security, the ability and background of the contractor, himself, are more often the governing factors. Drilling rigs are tools in trade and bankers usually take tools in trade only as a last resort and not as prime security. As is so frequently the case with equipment loans, the same set of circumstances which might bring about the inability of the borrower to meet his indebtedness is the same set of circumstances which destroy the market for his equipment in the event of forced sale. These factors should sound an everlasting note of caution to the overly ambitious contractor who is looking solely to size as life's chief objective.

About the Author

EUGENE McELVANEY is senior vice president of the First National Bank in Dallas. He has been associated with petroleum development not only as a banker making loans to oil operators but also as a director of several oil and gas companies and as an officer of an oil industry association. He was elected a director of Texas Pacific Coal and Oil Company in 1952. He also is a director of Tennessee Gas Transmission Company and Tennessee Production Company. McElvaney has been active in the affairs of the Texas Mid-Continent Oil and Gas Association, and he has served as treasurer of that association.

Accounting System. From a banker's viewpoint possibly the second greatest weakness in the average drilling contractor's operations is an inadequate accounting system. While the matter of accounting, of course, plays a very vital part in the conduct of any business, in no undertaking is it of more extreme importance than in contract drilling.

Experience with hundreds of contractors, including a critical analysis of their periodical balance sheets and operating figures, affords convincing evidence that while most of them know how to get a hole drilled to specifications, few of them really know the actual cost of getting the job done.

Without that precise knowledge how can a drilling contractor know (1) how to bid intelligently on a given contract, or (2) whether he has made a profit when he invoices the job? What are the various factors which constitute costs?

Does his accounting system include provisions not only for ordinary costs but for adequate administrative and overhead expense, for expendable items with adequate margin for unforeseen hazards, for replacement on an intelligent percentage basis the cost of the machinery he must depreciate on the job, for the cost of moving a rig, for all the various taxes applicable to his business, for obsolescence, for the myriad reserves every contractor should set up for the numerous contingencies he may encounter, as well as for the inevitable charges which the natural course of business will assess against his equity position? These are not factors for guesswork. They are matters for accurate determination by experienced and expert accountants in the field of contract drilling.

It seems amazing the number of contractors who employ a mediocre bookkeeping system wholly inadequate for the complexities they must encompass, indulging themselves in the illusion that so long as their wheels are turning they are bound to be making money. Not only does such practice inure to the disadvantage of the individual contractor but renders a disservice to the industry as a whole which must face a highly competitive field on the basis of unintelligent and sometimes ruinous bidding on the part of a large number of its members.

The vast majority of lease owners in letting drilling contracts want and expect the contractor to make a reasonable profit. It is thus sheer folly on the part of any contractor to bid work at a basis which can't possibly yield an ultimate profit, even though such bid be made in good faith but on bad accounting. No better investment can be made by any contractor than the installation of an accurate and wholly adequate accounting system.

Use of Credit. There are many ways in which the contractor's bank can participate in his financing requirements on a perfectly safe and legiti-

mate basis. Perhaps the most generally employed use of credit in this connection is in the form of temporary advances against completed and invoiced contracts. Here the contractor can realize in cash the full invoice price of the well immediately upon completion, thus permitting him to take his discounts and even employ his profits in advance of actual payment by the lease owner.

Most advances on this basis are on demand or a 30 or 60 day maturity to allow ample time for receipt of the check in payment of the invoice. Most banks accept assigned invoices from drilling contractors on a non-notification basis, so that the contractor himself receives the checks and accounts to the bank direct.

Most contractors in the course of normal operations are in position to acquire production from time to time which, of course, constitutes an ideal collateral background. Here the production is a valuable asset to assist in both current and capital requirements and many bank loans to contractors are so secured, although the proceeds may be actually used in the drilling business.

Advances against uncompleted contracts, except on day work after contract depth has been reached, are not usually considered good banking practice unless the financial position of the contractor be such as to otherwise fortify that type of loan. As in the case of bottom hole letters the risk remains inherent in the operation until the stipulated depth is actually reached. As stated before, drilling contractors, unlike building contractors, do not enjoy the benefits of "earned estimates." Their only earned estimate is the completed contract, and both the lease owner and the bank must look to the contractor for sufficient working capital to carry the hole to completion before the contract can become a bankable asset.

The ideal situation for any drilling contractor is to be able to confine his current borrowings to completed invoices or to loans secured by producing leases. Bank loans on rigs, as heretofore mentioned, are not ordinarily considered prime paper unless the general responsibility and background of the contractor be such as to make his credit good in any event. A drilling rig is a highly specialized and expensive piece of machinery good for only one thing on earth and that is to dig holes. Unlike a truck or a tractor or an automobile, a drilling rig has no universal market. Nobody can use a drilling rig, and nobody wants one, but a drilling contractor. It is not self-liquidating. It has to be paid for out of profits. Stacked and idle it's a liability until profitably converted into the coin of the realm. The purchase of rigs, like all tools in trade, should be financed by the owner's own capital, by the suppliers who are in the business, or by bank credit arranged on other considerations than a mortgage on the equipment.

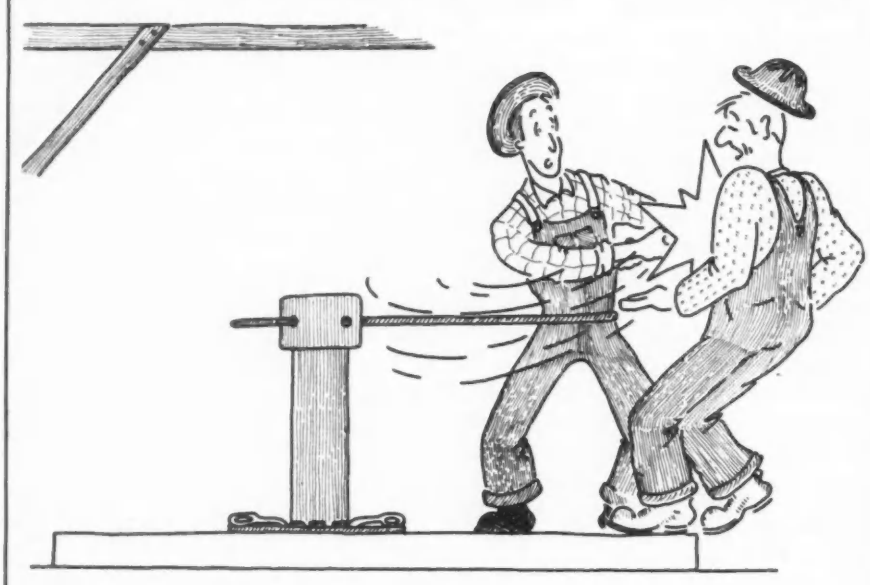
The problems of the drilling contractor are largely peculiar to his own business. Many of these problems are being solved, or at least simplified, for the individual contractor through the instrumentality of the AAODC. Here the best talent in the industry is available to its members, reaching out into every phase of operation from accounting practice to technical procedures in the field—all looking to a more efficient, economical, and profitable conduct of the drilling business.

After all, drilling contractors, like those engaged in any profit enterprise, are in business to make money. If by profits we mean nothing more than an added accumulation of worn out pig iron stacked on a vacant lot, the process, as seems to have been well proven in a considerable number of cases, is not too difficult. But if by profits we mean spendable increment in such form as will replace the worn out machinery and leave enough over to buy the baby shoes and the wife a new hat, then the process becomes an impelling challenge which, far beyond more physical production, calls for something of conservative judgment, a little economic discipline and certainly the adherence to a few well proven principles of business conduct.

—The End

ACKNOWLEDGMENT

This article taken from a speech before the American Association of Oil Well Drilling Contractors, Denver, Oct. 5, 1953.



It's Easy To Get Hurt!

The Accident: Two roughnecks were tightening the drill collar lifting plug with sledge and bar. The roughneck holding the bar was standing opposite the other. The latter swung, missed the bar, and hit his companion, causing chest injuries.

Recommendation: Man holding the bar should stand beyond the arc of the swing. When tightening up lifting plug on the collar, slow and careful work will accomplish as much as rapid, careless work—and without injury to men or equipment.

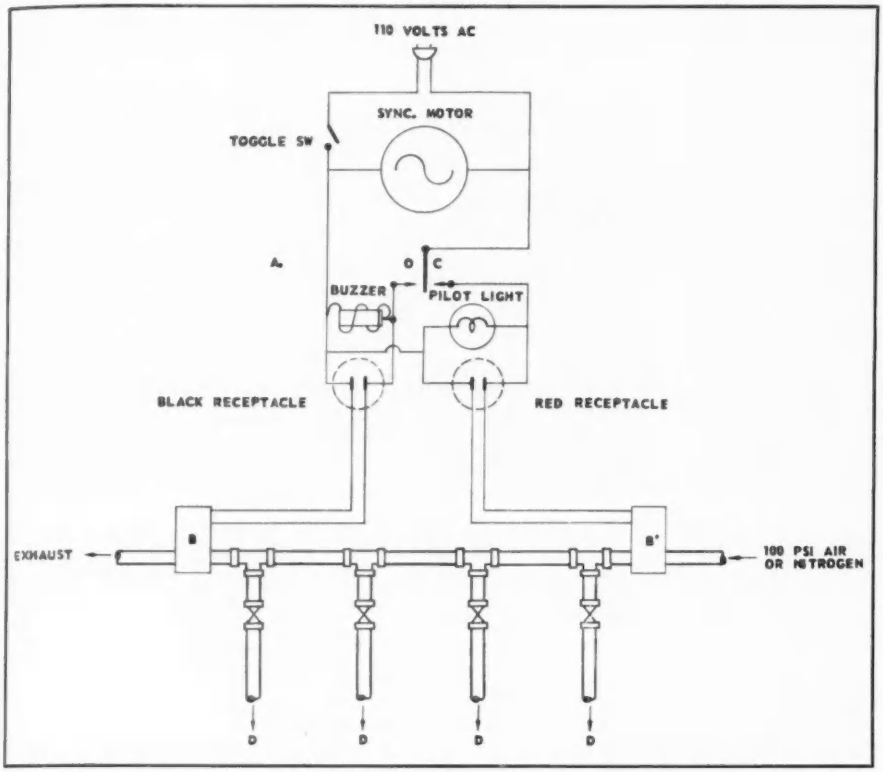


Fig. 1—Pressure and electrical system for automatic operation of filter presses. A—interval timer; B and B'—solenoid valve; D—Lines to filter presses.

Filter Press Control Facilitates Lab Scheduling

Electrical timer and two solenoid valves provide automatic operation.

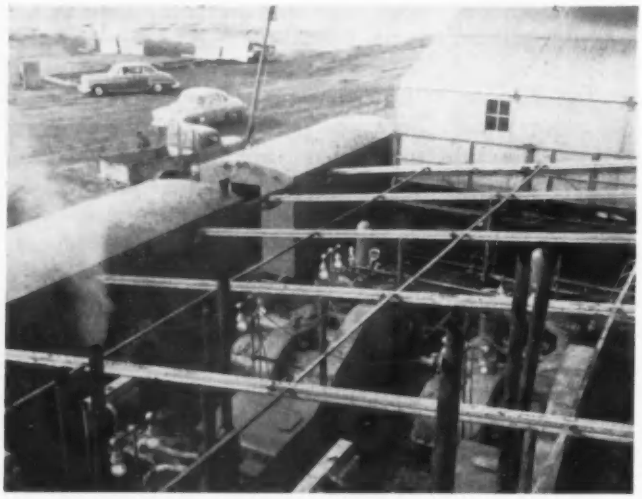
By C. J. ENGLE and W. E. BERGMAN,
Phillips Petroleum Company, Bartlesville, Okla.

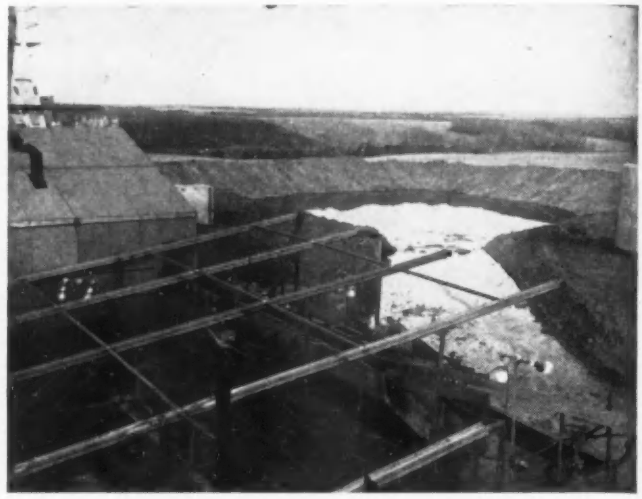
DEVELOPMENT OF THE automatic control unit for drilling fluid filter presses is facilitating proper laboratory scheduling. The routine testing of drilling fluids, whether in the laboratory or in the field, involves measurement of the viscosity, gel strengths, pH, and mud filtration rates. The procedures for these tests are outlined in the API Code 29, "Recommended Practice for Standard Field Procedures for Testing Drilling Fluids," Third Edition, May 1950. For cases such as the evaluation of an additive or the establishment of proper chemical treatment, numerous tests must be made in order to establish the effect of such variables as the concentration of the additive and of other chemicals with which the mud may be treated. These tests must be properly scheduled to achieve maximum utility of the laboratory equipment.

It was found convenient to prepare the samples in groups of four when possible at approximately 20-minute intervals. At the completion of the mixing period, the viscosity, gel strengths and pH of the samples are obtained. In the interim required for 10-minute gel strength determination the preparation of the next group of samples may be started. Subsequent to the gel strength determinations on the four previous samples, the contents of the Stormer cups and remaining portion of the samples are poured into the Baroid filter presses for the standard 30-minute interval at 100 pounds per square inch. By adhering to such a schedule two operators can test about 60 samples in an eight-hour period. The equipment required includes eight stirrers, four viscosimeters, eight presses and a pH meter.

Even with this equipment the water-loss determinations proved to be the most difficult to schedule and complete during the working day. This limitation has been removed, however, by making these determinations automatic, permitting them to be completed during the noon hour or after working hours. The arrangement to accomplish this is shown in Figure 1. As shown, each automatic unit consists of an electrical timer, two solenoid valves of the normally closed type and four filter presses. The number of filter presses per unit may be increased or decreased as desired, and each press in the unit may be manually removed from service by means of the valve connected in series with each press. The electrical timer has an operating range of 30 minutes and contains a cam-operated switch which energizes one or the other of two-convenience outlets mounted in the case. During the timing interval the switch connects with the "C" position and opens solenoid B' which admits 100 psi air or nitrogen to the presses. At the end of the 30-minute interval the switch connects with the "O" position so that solenoid B' is closed, B is opened, and the pressure is released.

The automatic units operating on AC current have been in laboratory operation for several months and have given satisfactory service. The only precaution required is to provide clean air or nitrogen to prevent clogging the valves. For field operations where AC current is not available, spring-driven timers, such as those now widely used by mud engineers, may be adapted as the controller in Figure 1. These timers have a lever which is moved through a 90-degree arc at the start and end of the timing interval. The movement of this lever could be used to close and open micro or mercury switches suitably connected to a 6-volt DC power supply to activate solenoids having 6-volt DC coils. **—The End.**





LAYOUT OF ROOF structural members is shown from this elevated view. Note that engine house already is enclosed with similar paneling. Arrangement of doghouse, tool house and other skid-mounted buildings, provides shelter on the one side; also means of supporting ends of channel iron rafters. On the right is a view looking toward upper end of roof showing how rafters are extended to provide shelter over mud ditch, tanks and shale shakers. Heat from slush pump engines contribute to heating of roofed-over areas.

Unitized Sections Make Rig Winterizing Easier

Here's an improved system of paneling that saves much of the time and effort usually required to batten down a site for winter operations.

AN IMPROVED system of paneling that greatly reduces the time and effort usually required to winterize the rig, engine house mud ditch, tanks and shale shaker area, has been developed by a company operating in Central Alberta. The system is unique in that bolting or other types of fasteners are eliminated, a factor of some importance when men are hampered by heavy gloves and clothes. The supporting framework, unitized so it is easily handled and transported between locations, is so designed that the plywood-covered 8 x 8-foot roof panels may be shoved along a channel iron "track," one after the other, until a given section of the roof is completely covered.

The as-yet uncovered mud pump area shown in the photographs, affords an opportunity to view the simple, yet sturdy structure which supports the roof panels. The sloping roof rafters are made up of lengths of 3-inch channel iron, with open side looking up, which are welded atop equal lengths of salvaged 3-inch line pipe. Length of each of these sections is approximately 16 feet. To one end of each length of pipe is welded a stub of 2½-inch pipe, permitting the several lengths to be telescoped together and form a continuous section. Short, flat bars welded to the sides of channel iron ends eliminate any possibility of one section to rotate and become out of line with respect to its adjoining section. Eight-foot spacers of T-bar material clipped to brackets welded to the sides of the channel iron provide lateral rigidity and at the same time hold the channel iron sections to exactly eight-feet on centers. The whole structure is supported by 3-inch pipe posts, these being so spaced and positioned as to give the least amount of interference with normal walking areas between mud tanks, pumps and engines. These posts are telescoped over short stubs of 2½-inch pipe material welded to the under side of the 3-inch rafters, minimizing any possibility of their skidding or shifting due to vibration or accidental bumping.

One of the factors contributing to the success of this installation is the method of arrangement used in spotting dog houses, generator house, tool house, water tank and other skid-mounted units. By stringing them out end to end, but with sufficient work area between ends to allow loading or unloading of supplies, these houses serve both as a sheltering wall and a means of supporting the lower ends of the half-dozen rafters strung over the pump area.

It will be noted that the lower ends of the roof members are attached by means of a simple clip and pipe saddle device welded together out of salvaged materials. The same type of device is used also on the bars which span the space between ends of the several utility and dog houses.

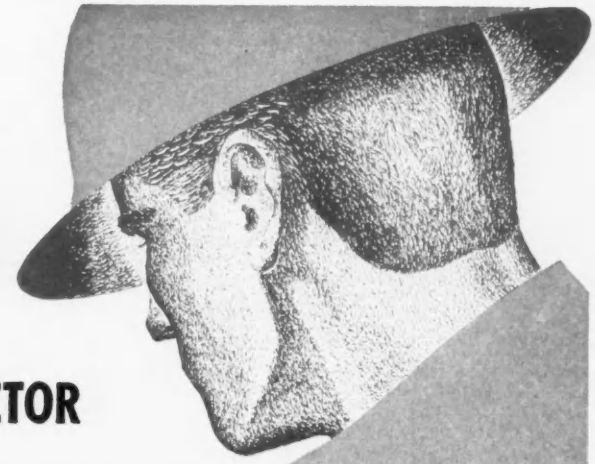
In order to assure that all segments of the roof system will fit every time they are rigged up, all mated pipe ends and their corresponding supporting saddles are numbered. An electric arc was used for this num-

LOCK ON

VETCO

OFF-N-ON

DRILL PIPE AND CASING PROTECTOR



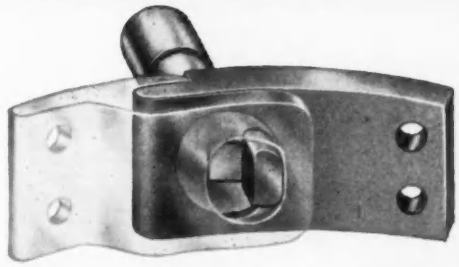
The VETCO is installed on the pipe. Cam locks are engaged easily by hand. And then are locked tightly by means of a "T" handle wrench which is the only tool needed.

pays for itself in rig time saved...

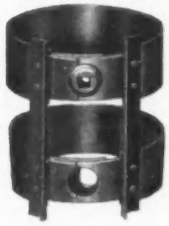
VETCO Protectors go on and come off fast—8 to 10 seconds. With one quick motion you lock VETCO Protectors on the joint you want. You get complete flexibility and complete control with rubbers on only the joints you want. Your own crew puts Protectors on and off without waiting for a service crew.

The cam locks the Protector on with a tight grip that won't jar loose, can't slip, and won't move in any way. This cam lock is easy to open and to close; yet it closes with a positive grip that can't work loose. The cam lock is an integral part of the VETCO Protector with nothing to misplace, nothing to drop off in the hole. Frequent changes do not hurt the Protector.

So now with complete freedom you can use pipe progressively throughout the string. The same rubbered pipe is not used at top hole all the time. You no longer need to lay down rubbered pipe while tripping. VETCO Off-N-On Protectors will pay out in rig time saved.



The forged cam lock is built right into the VETCO Protector. Nothing to come loose and fall in the hole. Nothing can loosen the tight lock.



The alloy steel bands form a strong skeleton to grip the pipe. Rubber is compressed between the metal bands and the pipe for a tight grip which prevents movement of the protector.

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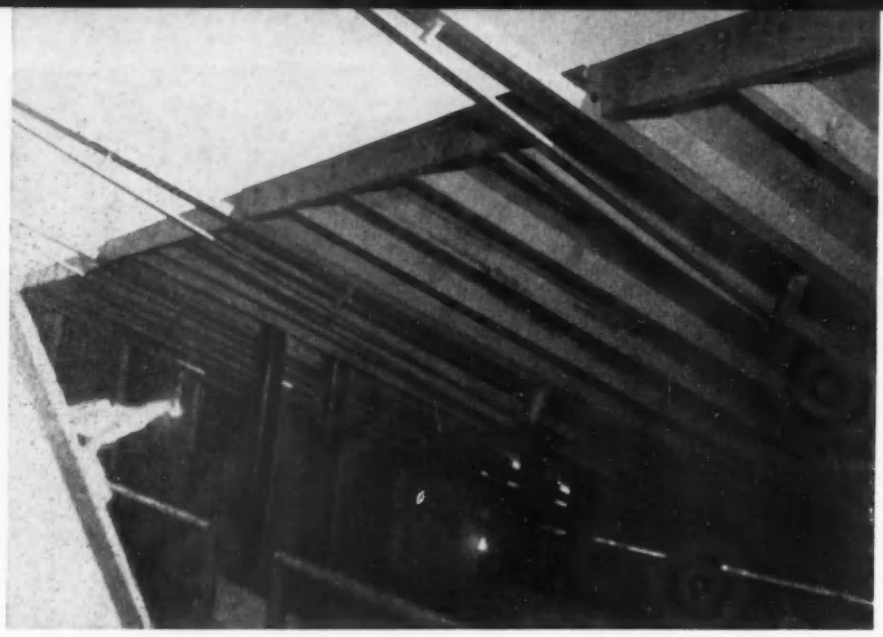
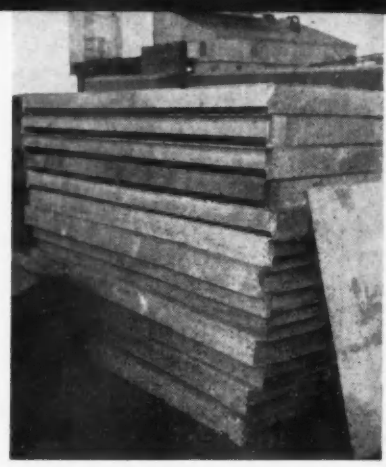
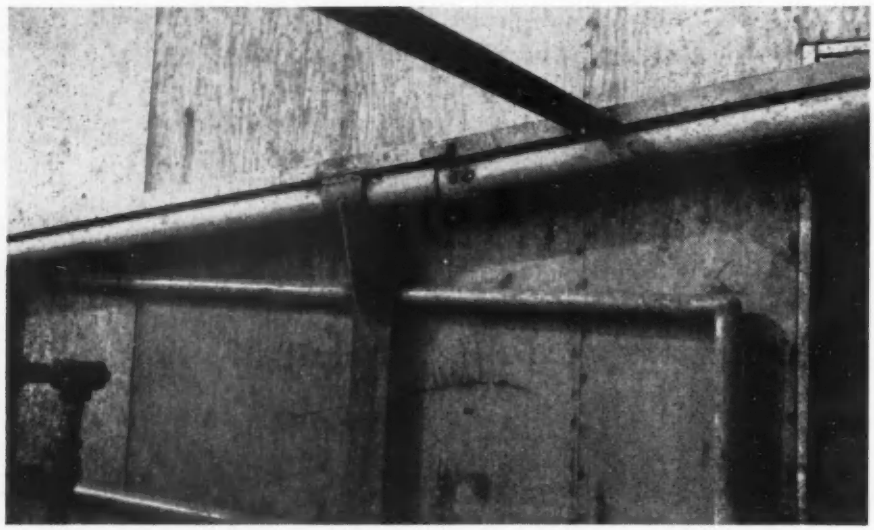
324 NORTH VICTORY BLVD., BURBANK, CALIF. — Phone: Rockwell 9-2543
507 BRYAN STOCK TRAIL, CASPER, WYOMING — Phone: 5942



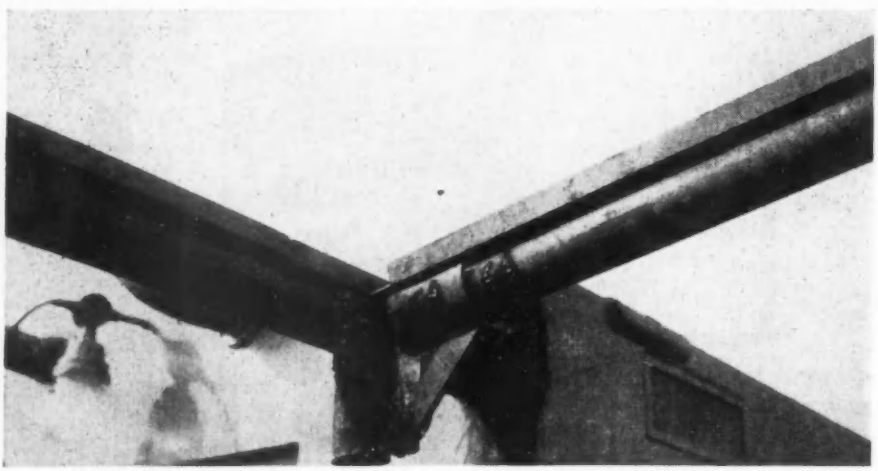
LOOKING UP at roof panels over the engine house. Although rafters are of different design, being all-welded, truss-type construction, the method of sliding unitized panels along upturned channel sections is the same as described for the mud pump area shelter.



ROOF PANELS ready to be slid into place along channel sections. Note that 2x6 side members, or "skids" are tapered slightly so as to better fit inside radius of channel webs and to facilitate sliding them along the steel track. Strip of plywood nailed to under side of runner elevates that end of panel sufficiently to allow overlapping of extended sheet on to adjacent panel.



HOW TO SUPPORT sloping rafter beside panel-enclosed engine house. Pipe sections are joined by telescoping 2½-inch stub pipe inside adjoining end of a 3-inch pipe, the whole then being supported in pipe saddle welded to upright post. Short bar welded to side of channel section assures alignment of each unit.



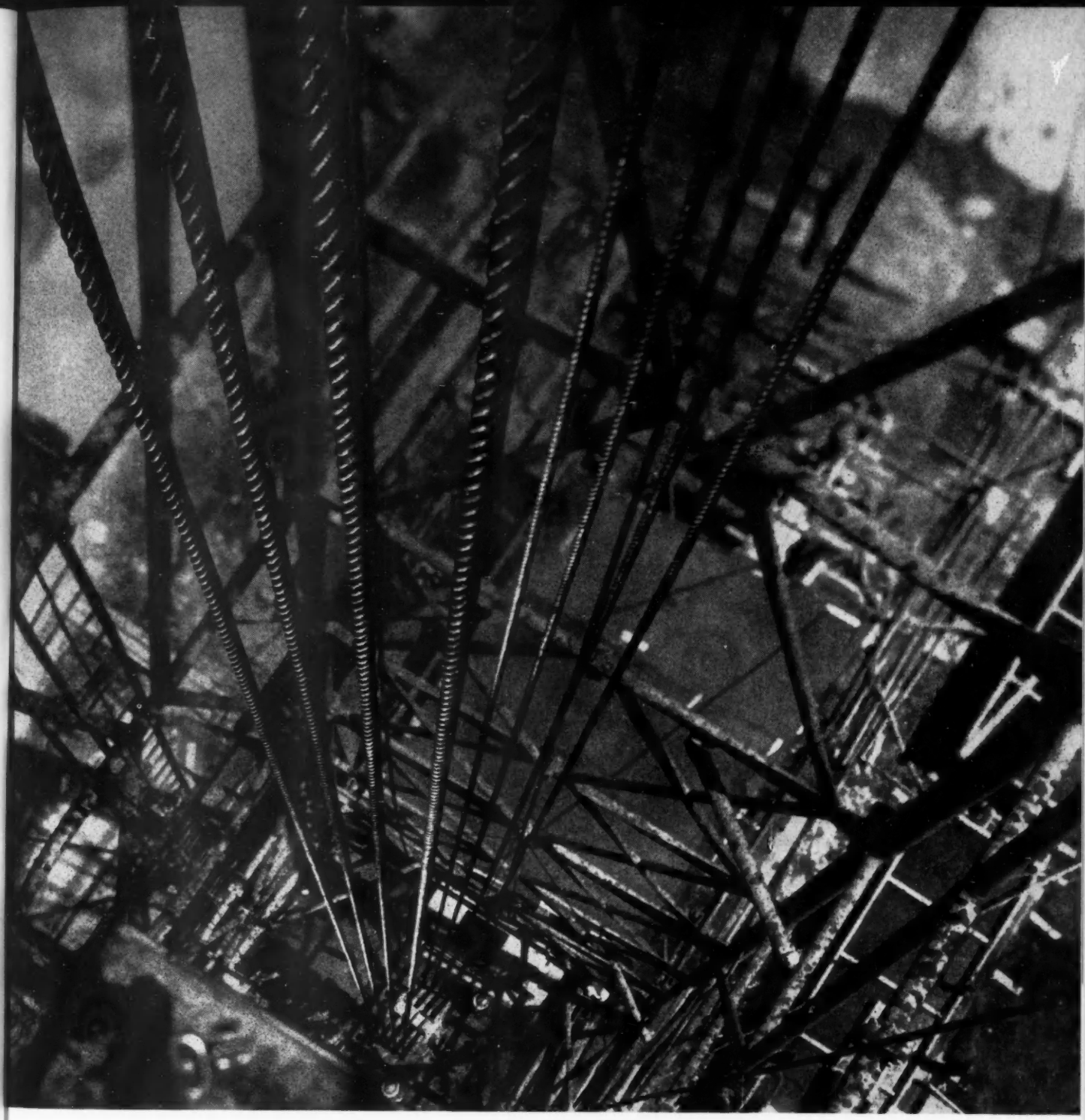
CLIP-AND-HANGER DEVICE supports the lower end of each of the rafters. Note that matching segments are numbered to simplify mating of pieces when structure is re-erected at new location.

bering, assuring positive identification that cannot be erased or smudged.

The roof sections are 8 x 8-foot frameworks of 2 x 4 and 2 x 6 lumber and are covered over with ¼-inch plywood sheeting. To assure proper run-off and protection from the weather along the gaps that would exist between panels, the plywood is allowed to extend two or three inches beyond the back, or trailing, edge of the frame. To compensate for this overlap, the lower edges of the 2 x 6 skids are equipped with 2-foot strips of the same plywood material, the latter lifting the frame just enough to allow smooth overlapping of the sheeting; in effect forming a shingle over the gap that ordinarily would be left between sections. Gaps along the sides of the panels present no problem since they fall over the channel iron track.

Of value in this type of unitized, easily assembled structure is the fact that the steel supporting framework can be erected well in advance of the actual need for enclosing the area. When snow or cold weather does occur, it then is a simple matter, and the work of only several hours, to slide the roof panels into place.

Initial cost of this type of structure will be amortized many times over because of the speed with which it can be disassembled and re-erected; also because of the 100 percent salvageability of all materials and unitized sections used in its construction.



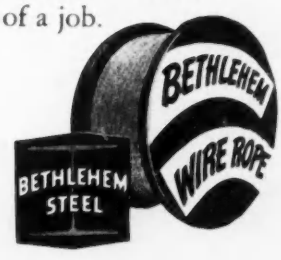
Wire Rope at Work—The job of working over a deep, cantankerous oil well is often tougher than drilling the hole in the first place. Here, for example, is a mean workover chore where the well had passed 11,000 ft—in an area that often requires dual completions. The outfit shown handles full strings of 3-in. tubing, as well as drill pipe ranging from 2⅞ to 3½ in. od.

For this heavy service the rig uses 1⅛-in. 6 x 21 Bethlehem wire rope with the Form-Set (preformed) construction. The nature of the job requires far more trips than in normal drilling operations; in addition, it is sometimes necessary to take full-capacity pulls to remove old or stuck liners. Since the contractor uses Bethlehem rope exclusively, it seems pretty clear that the rope is doing a whale of a job.

Bethlehem Steel Company, Bethlehem, Pa. On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation

Mill depots and distributors from coast to coast stock Bethlehem rope for the following industries and numerous others:

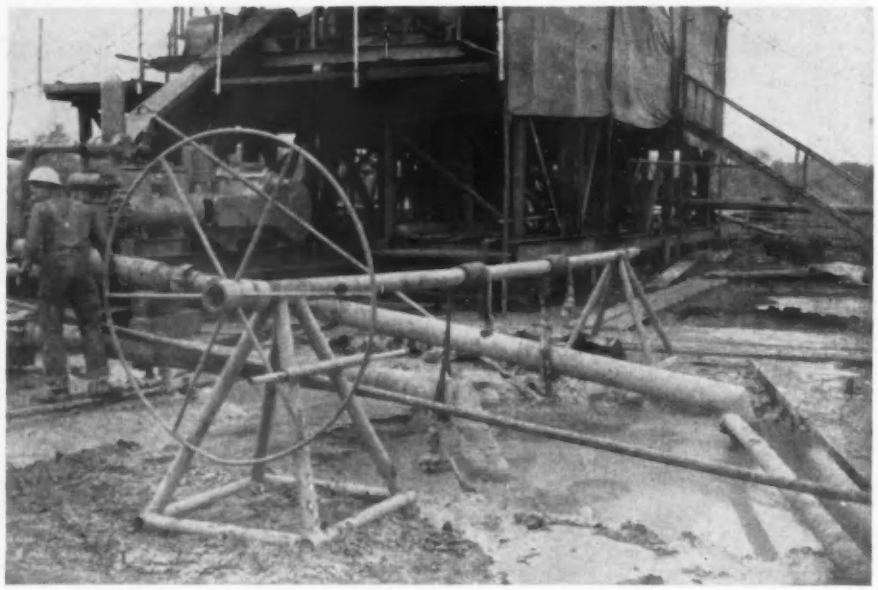
PETROLEUM • MINING • CONSTRUCTION • EXCAVATING • QUARRYING • LOGGING • MANUFACTURING



How to do it

DRILLING HINTS

$10 is paid for each illustrated acceptable contribution. Mail to The Editor, WORLD OIL, P. O. Box 2608, Houston 1, Texas.



Regulating Suction Lines

Expedite the handling of heavy suction lines and safeguard expensive suction hose by making a windlass and stands for easy regulation of suction line heights. Make two four-legged, tripod style, pipe stands—to cradle a windlass shaft made of a length of four-inch drill pipe. On one end of the shaft mount a large diameter spoked wheel. This provides the leverage by which the windlass can raise or lower the suction lines.

A sufficient length of cat rope to provide maximum positioning of suction is wrapped around the shaft at one end and tied around the suction lines at the other. Adjustments of heights are made by one man turning the wheel while another man holds tension on the knotted end of the rope on the shaft. If the opposite line is too high, slack can be let off second rope to let the suction fall into proper position.

Weld a two-inch nipple to one pipe stand as shown. Slide a smaller diameter pipe inside of this nipple. This provides an effective locking device for the wheel after proper height adjustments are made.

Note that the base of the stand is widespread. When normal leverage is applied the stand is stable.

Combining Structures

Design an all-purpose, combination structure to eliminate the need for separate buildings. Here's how Brown Drilling Company, Bakersfield, Calif., did it.

First, as a sub-base for others, is an all steel tool house, which is a rectangular box-like building with lifting ears at each of the four top corners to simplify loading and unloading. It has one hinged door on the side opposite the derrick, and is equipped with a set of hinged steps which fold up and over into the building before the door is closed. The building rests upon a pair of elongated A-frame supports, just high enough to elevate the roof, or top surface flush with the floor of the rig.

Superimposed upon this building is the conventional doghouse with openings facing the derrick floor. It also is equipped with lifting ears to facilitate handling. Since the doghouse occupies only about half of the top surface of the tool house, the remaining space is railed off with a safety fence and is used as a storage space for bits and other small equipment frequently used.

Sure, it's BIG

but that's only half the story!

You get some idea of the size of this 36" hole opener by comparing it with the standard 3⅞" four-cutter bit held by H. C. Smith, president of the H. C. Smith Oil Tool Co.

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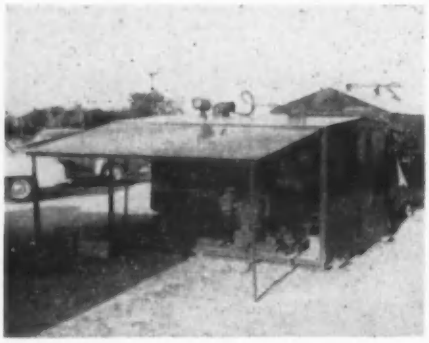

Moving Small Buildings

To move small buildings, such as the generator shed or tool house, attach permanent lifting devices to the roof structures. Weld heavy steel lugs to the frame at a point where the center of gravity will fall, and in turn fasten wire line bridles to these lugs with rope clamps. The bails will always be in position for the hook or a motor crane or truck boom winch, and each building can be lifted bodily with contents either from a truck, or from the ground as the case may be.

This device is a time saver, as the crane operator, or his swamper need only guide the hook into the bridle.

Unitizing Generating Plant

Unitizing the electric generating plant with its individual fuel tank has been accomplished by Miller & York, Bakersfield, Calif. The generator plant can be operated up to nine days without refilling the 480-gallon fuel storage tank which rests beneath the equipment supplying source of illumination.

The sills supporting the generating plant are attached solidly to the top of the fuel tank, and are equipped with rings, or bails into which bridles can be inserted for lifting with a motor crane when moving. In addition to these lifting devices, flanged spools are attached to each of the four corners so that a different method of moving can be used when necessary. This self-sufficient generator can be set at any convenient point at the rig, regardless of the location of the principal fuel tank which supplies the mud pump and drilling engines.

Installing Dump Valve

Install a dump valve in floor of the flume where the ditch is attached to shaker outlet to change circulation abruptly or divert circulating medium to a separate tank.

Operation of this valve is done in-

Always UP TO THE MINUTE and DOWN TO THE FOOT!

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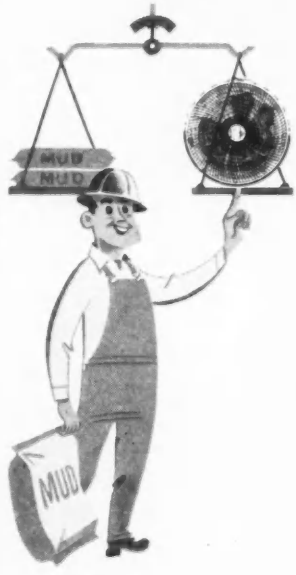
KEEP YOUR MUD IN BALANCE with

"Mud-O-Graf"



- Provides accurate information for uniform mud control.
- Helps prevent blowouts by showing the duration and relative amount of gas in gassy streaks.
- Eliminates guess-work in the use of weighting materials, chemicals, and water.
- Indicates graphically all heavy and light streaks in the circulating system.

The condition of mud in the hole is recorded automatically during every minute of the drilling operations. Weight variations of less than 1/10-pound per gallon can be detected. Mud-O-Graf has been proved in twelve years tough field service. It eliminates trial and error methods of adding weighting materials. It detects gas or salt water incursions which could cause blowouts.

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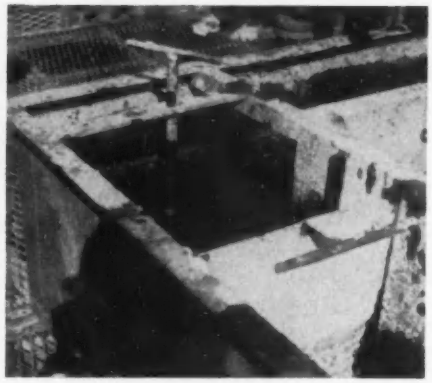
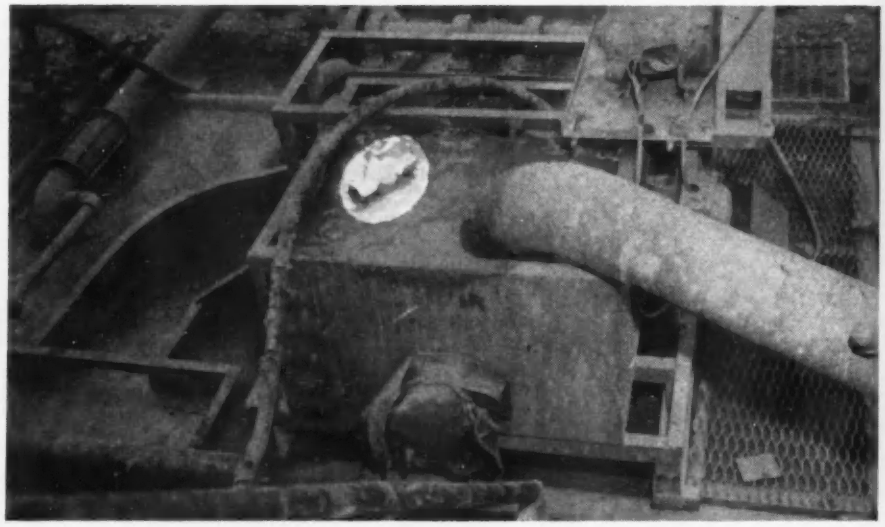


stantly by pulling up on a T handle rising vertically through a substantial steel cross member reaching from one rim to another immediately above the dump valve.

If the operator has other duties which claim his attention for the few succeeding moments, the valve may be locked open by twisting the stem either to the right or to the left. The hole through which the stem rises has an elongated slot so that a finger on the stem can pass, but when turned to either side, rests upon the cross member to hold the valve open. Closing is done by reversing the operation, so that the finger can pass through the slot permitting the valve to seat promptly as it drops down through the mud, or oil, as the case may be.



Bypassing Shale Shaker

Use a valve for routing mud and cuttings through a by-pass where fluids are heavily laden with lost circulation material, and where shaker operations are not desired.

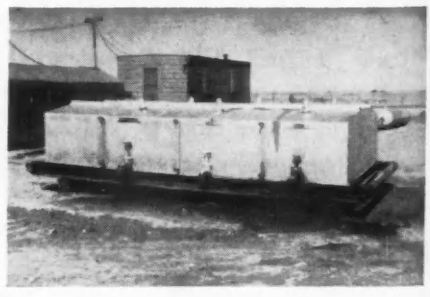
One New Mexico operator has built a spillway for return drilling fluids, with a valve arrangement such that the fluids may cascade over the screens of the shaker, or may be transferred directly to the return mud pit trough.

The valve is opened and closed by an auxiliary extension, composed of a two-inch pipe welded to the valve stem. A short length of pipe is welded to form a cross T for a handle as shown by circle of light.

Note the trough arrangement at left and the walk at right of shaker.

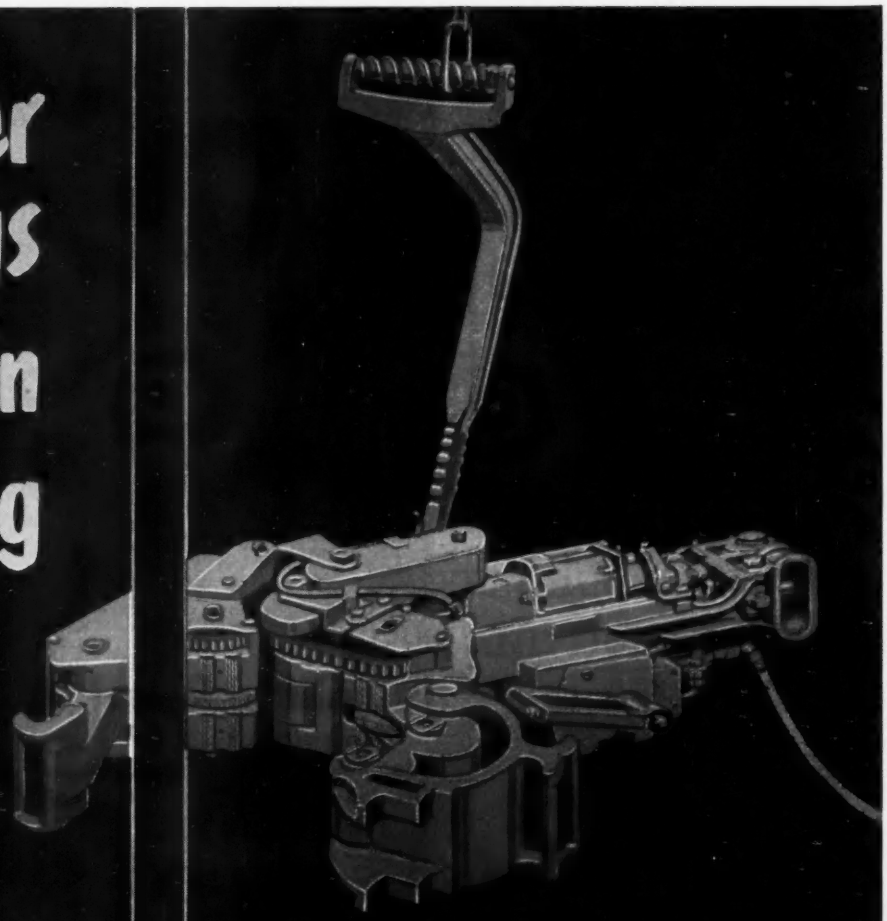
Storing Lube Oil

Store an adequate supply of lubricating oil at the rig, by constructing a large unit containing six separate compartments. Finish each compartment with a recess within the shell to contain a gauge glass for visual inspection of the contents. Mount this tank on a skid base with pipe rails at each end for lifting from its setting on the ground to a truck when the rig is moved to another location. If out of service temporarily, it can be



mounted on a supply truck to deliver six different types of lubricant to other wells where rigs are active.

power pays off in drilling



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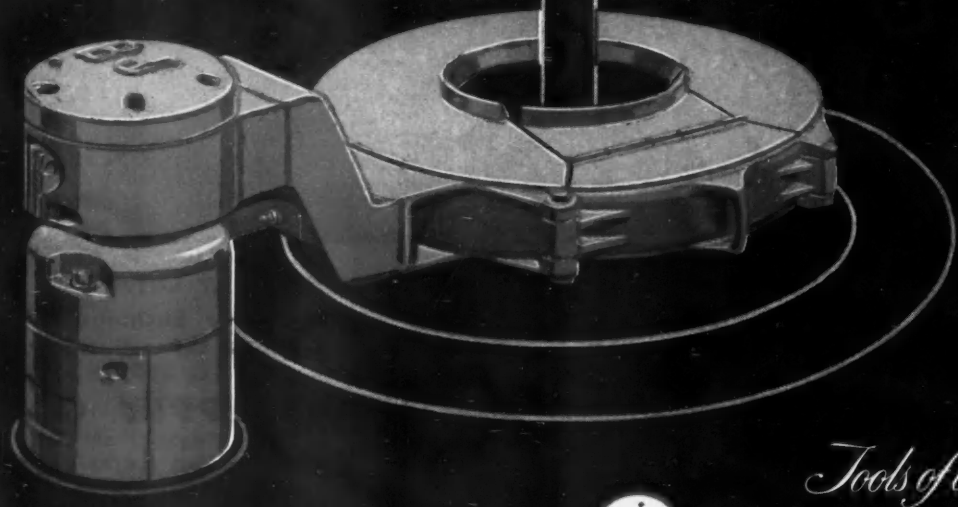

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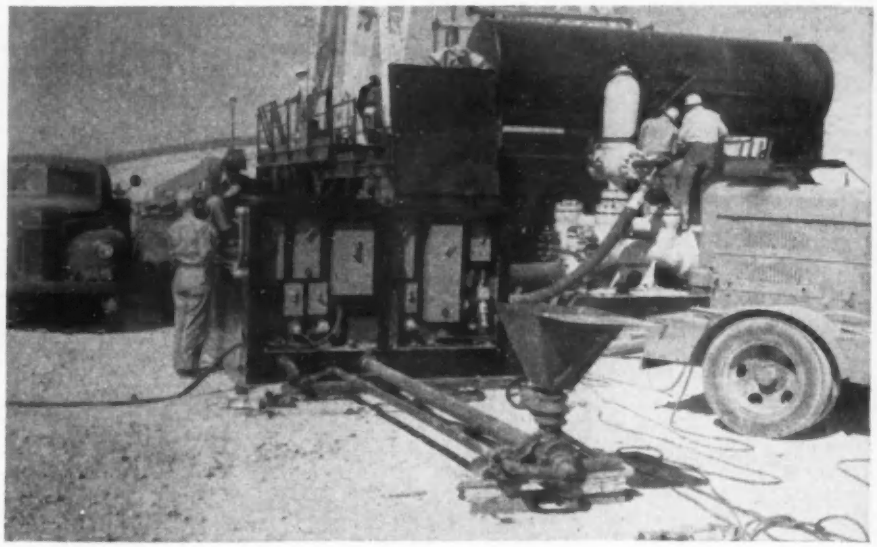

Installing Panel on Mud Tank

To concentrate equipment in a position for immediate use without rebuilding, or reconnecting certain parts each time a rig is removed, the end of the principal mud tank can be converted so that the electric control panels may be installed.

As mud components are required at intervals, the mixing nozzles with the hopper are installed on lines attached to other fittings permanently installed in the walls of the vessel so that the mixing pump might constantly blend the components into a definite type of circulation fitted to the formation being penetrated.

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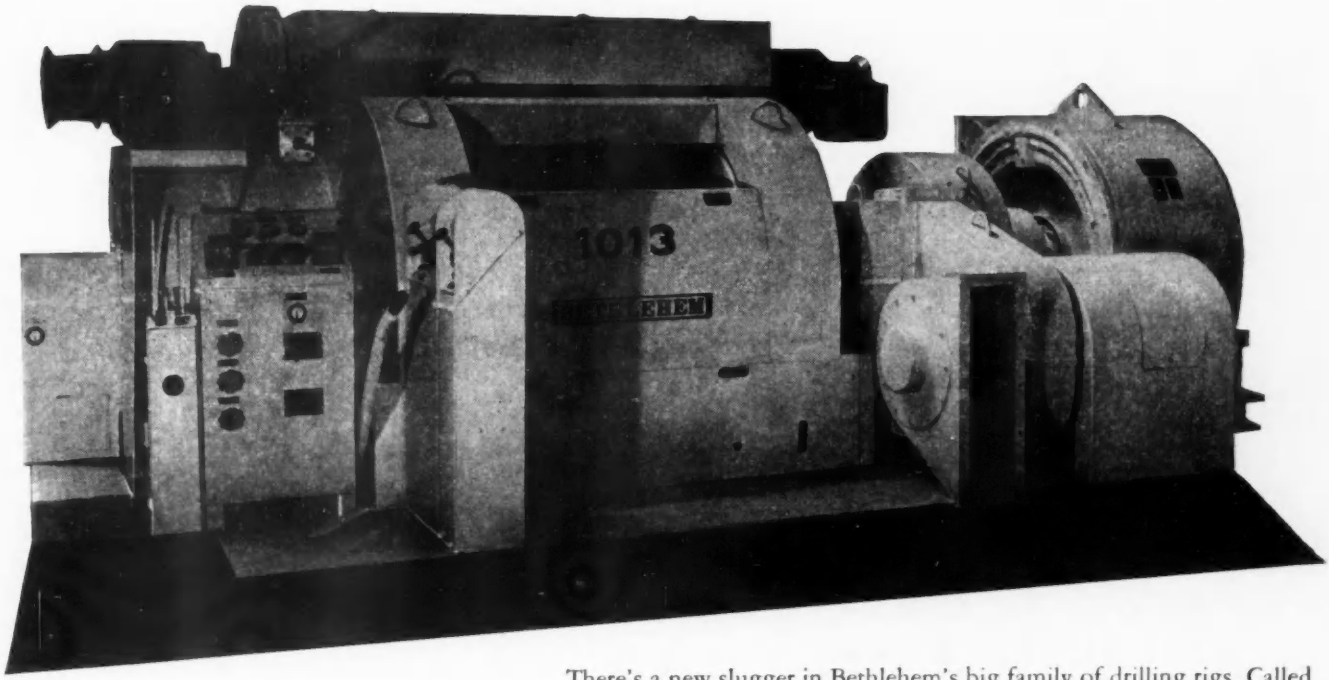
A POWERFUL NEW RIG FOR MEDIUM AND DEEP DRILLING



There's a new slugger in Bethlehem's big family of drilling rigs. Called the 1013, it is a heavy-duty outfit used for both medium and deep drilling jobs.

The 1013 has power to burn, and it's a sweet-running outfit. Smooth, easy to operate. All controls at the driller's fingertips. No other rig of its size has ever been as simple to handle.

It permits wide latitude in the choice of drive, being available for mechanical, electric, or hydraulic coupling or hydraulic torque-converter, whichever may be desired. It also allows complete freedom in the selection of engines and engine combinations.

This big rig has extra-capacity clutches, extra-heavy shafts and brakes. Yet despite its rugged members, it is compact . . . easy to move. Because of an unusual arrangement of transmission speeds on the No. 1 engine drive group, the drawworks need not be split to keep within prescribed road limits. Moreover, this type of arrangement makes the rig especially adaptable to electric motor or hydraulic torque-converter application.

Why not see the 1013 and study its many features? A Bethlehem engineer will be glad to go over them with you, point by point.

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HINTS . . .

Widening Bit Courses

Widen the water courses on the bit to solve some of the problems posed by high-pressure gases encountered in cable tool drilling. By keeping the bottom contact surface of the bit small, the bit will not tend to leave the bottom of the hole when subjected to the high-pressure gases.

Select a bit one size smaller than the bit used for drilling and enlarge the diameter of the lower two feet by forging. Dress out the water courses so that the gas is able to escape without blowing the tools out of hole. The upper section of the string which is of a reduced diameter, will provide sufficient clearance for the gas to bypass.

Cable tool drillers in Kansas and Pennsylvania are using this wide course bit for drilling in operations.

Supporting Weight

Instead of running the wire line supporting the tongs and counterweights through the floor, or suspending the weights within the derrick immediately above the working space, one contractor suspends the weights at a convenient height within the frame of the mast or derrick, inside sheaths or protectors which in turn are solidly welded to supports attached to the girts of the structure. They remain inside these protectors at all times, and are locked in down position with a bolt run through a hole matching the weight bail when lowering the mast type structure for transportation.

When the derrick is placed in operating position, removal of locking bolt releases the weights and tongs ride freely at the desired height above the table. If a wire line should part under long use, the sheath retains the weight above the working space on the derrick floor with complete protection of the men working below.

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"Rumba" Shale Shakers excel in performance and low cost maintenance. They come to you completely unitized on 10 ft. skids . . . no rigging up costs in the field. The underslung screen cloth, with no obstructions on the bottom removes sand by a new method of flotation which reduces wear on pumps. This design contributes to the longer screen cloth life . . . one of the features that is causing the worldwide demand for "Rumba" Shakers.

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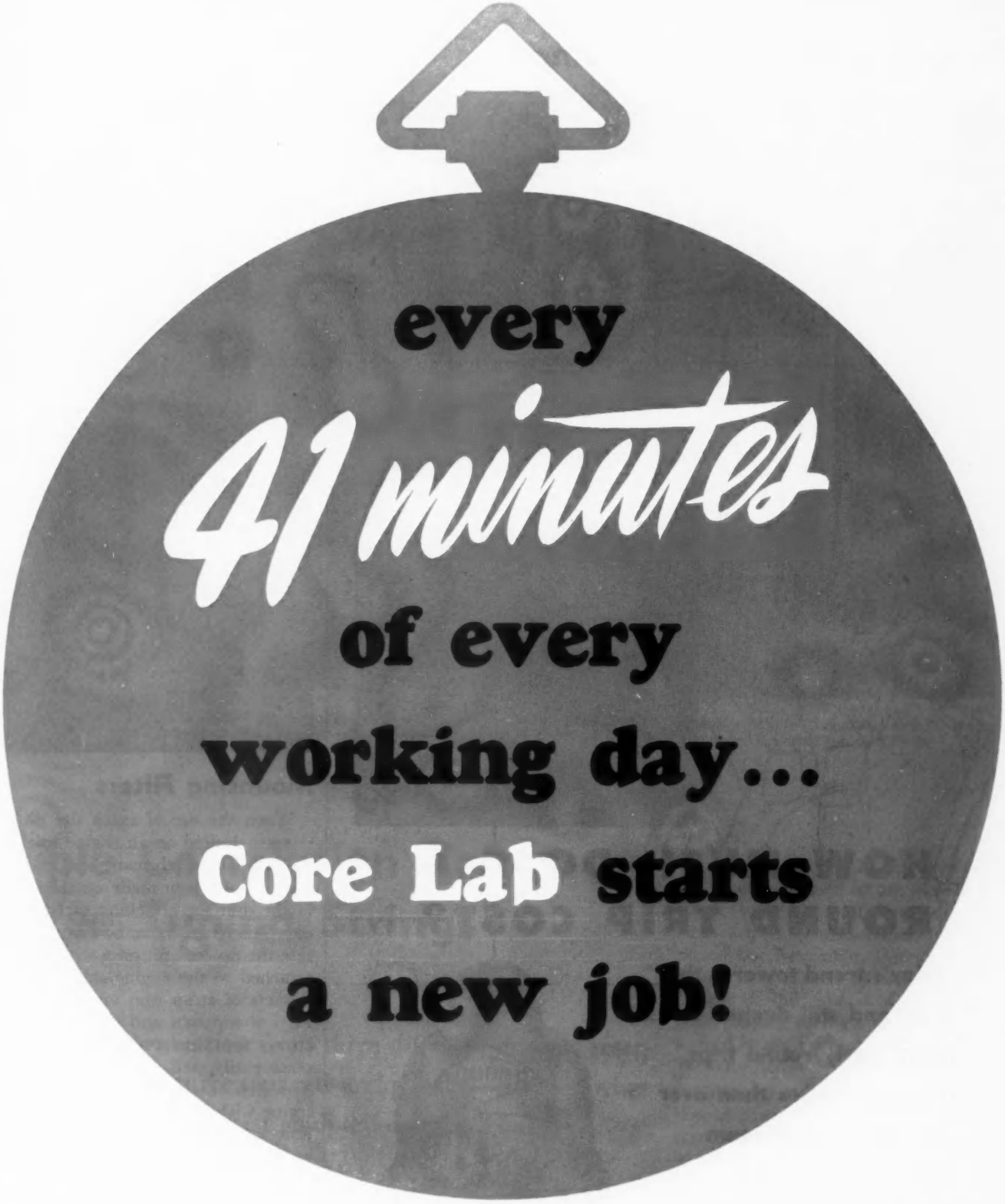
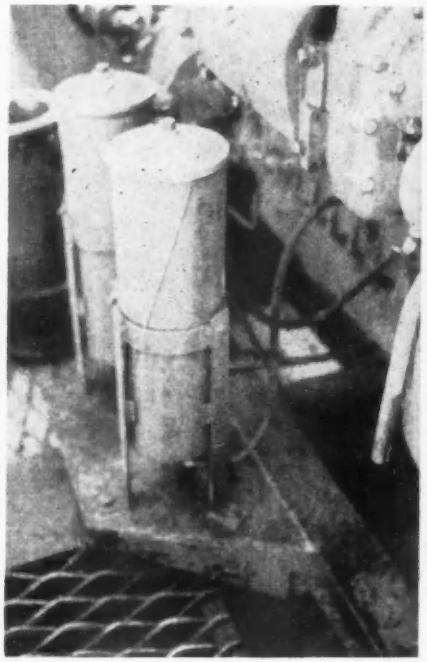


"Providing more reservoir revenue . . . through the production of more recoverable oil."

Unitizing Water Well Pumps

Unitize and skid-mount water well pumps to save time and trouble during rig moves. One West Texas drilling contractor has unitized his water well pump by placing the jack and prime mover on pipe skids so that it may be moved as a unit.

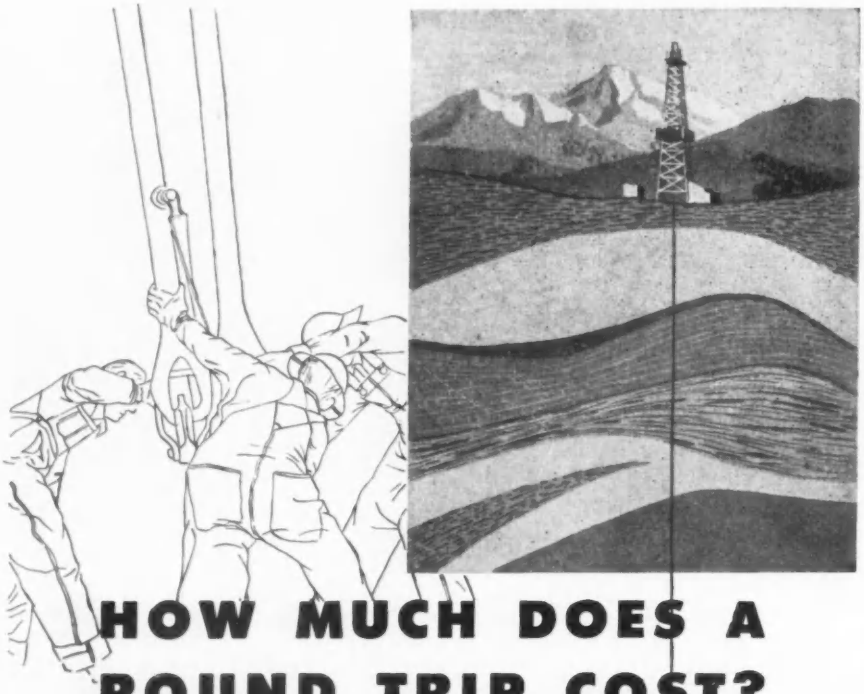
Weld two pipe skids from five-inch pipe to three horizontal braces and install pump jack and diesel motor on the skid. Weld a hood for the motor from sheet metal to protect from weather, as shown. During moves, chain drive to the gear box, is removed and tied to the unit.



Mounting Filters

When the use of extra size oil filters are desired on an engine to clean the crank case lubricant, and no provisions have been made on the frame of the unit for attaching such equipment, these units can be mounted beside the power unit on a step-bracket attached to the engine skid member. Baskets of strap iron are made with vertical supports and circular retainers so the filter cases can be set in place easily, and removed as quickly. The step bracket is connected to the frame with locking lugs so the entire unit can be removed after disconnecting the flex lines leading to and from the filter cases.

This apparatus provides means of replacing filter cases without removing cap screws from the engine casting, and is accomplished by shutting off the flow of oil by controls placed at the engine oil openings, and disconnecting the flexible lines. Replacement filter cases are held, filled with filter elements, so that a minimum amount of time is necessary to change filters.



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Today's trend towards the deep and still deeper wells make costly round trips more expensive than ever Men in the petroleum industry appreciate Christensen diamond drilling bits for fewer round trips LESS COST PER FOOT.

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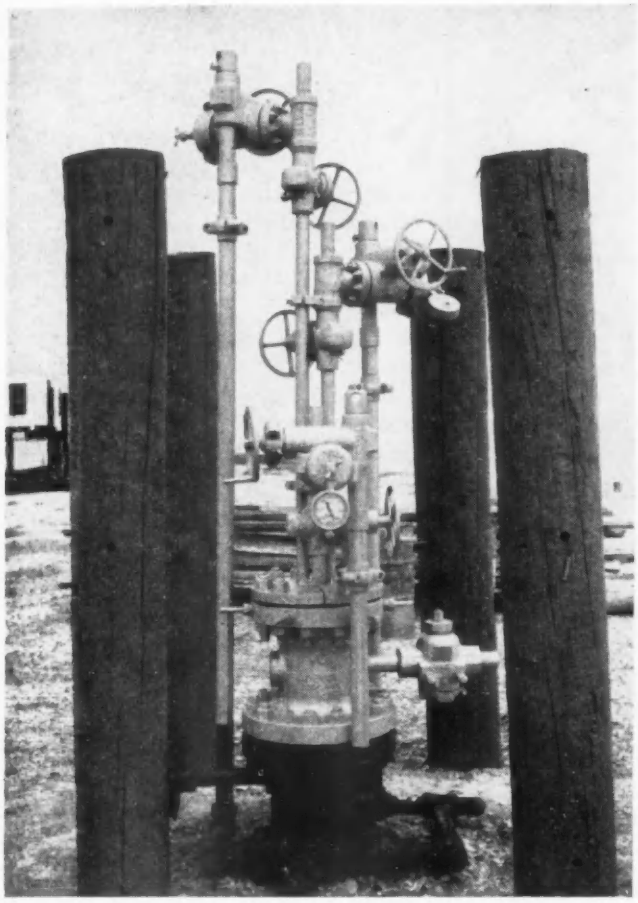
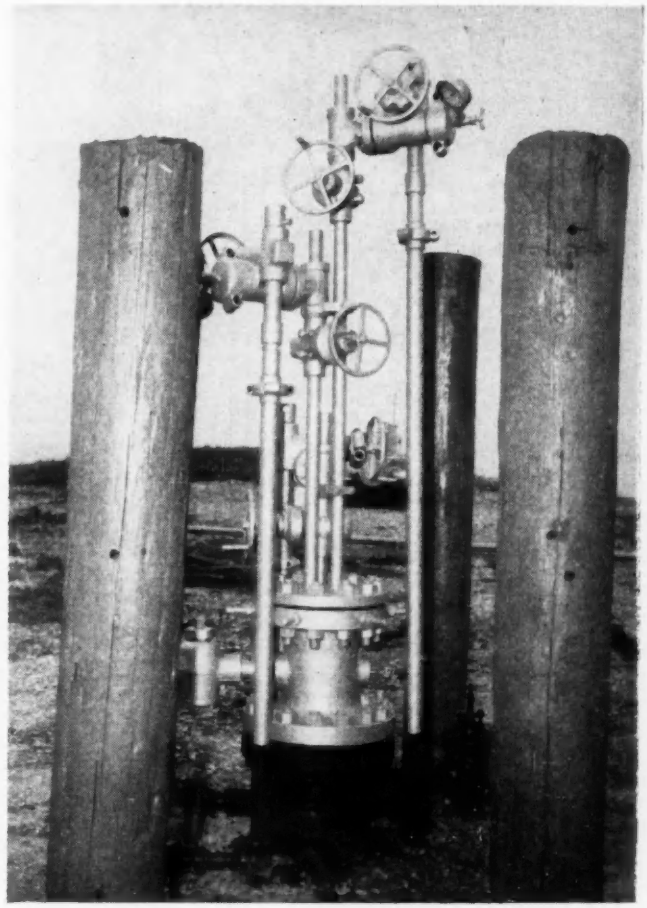


1 **FRONT VIEW** of completed wellhead assembly for triple completion using three parallel tubing strings.



2 **REAR VIEW** showing specially designed head to accommodate the three 1½-inch tubing strings.

Triple Completion Takes Three Tubing Strings

Production from three different dry gas reservoirs handled by three separate and parallel strings in what is believed to be the first completion of its kind.

By ROYAL W. REISS, Superintendent,
Aluminum Company of America, Mining Division, Port Lavaca, Texas

A TRIPLE COMPLETION employing three parallel strings of tubing was made successfully in June, 1953, by the Aluminum Company of America's Mining Division in the Steamboat Pass field of Calhoun County, Texas. The installation was made in an old dry gas well, Alcoa's State of Texas Tract 177, Well 1, which was worked over and recompleted. Production from three separate gas zones is handled separately by each of the three tubing strings. This installation followed prior successes in making dual completions by running two parallel strings of tubing in wells located in the same field. These were three shallow, dry gas wells which were successfully completed last November, December and January by Alcoa's Mining Division. Details of this type dual completion with parallel tubing strings were described in the February, 1953, issue of WORLD OIL.

Other operators have shown more than a passing interest in this type of completion. Because of the complexity of equipment usually involved, and particularly where considerable wire line work was required, many operators have been reluctant to make multiple completions. This type of completion with parallel strings is actually no more complicated than any other completion where a packer is used. Once the setting has been made, the well actually becomes two wells which can be produced separately just like any other well where the casing annulus is sealed off. It would be possible

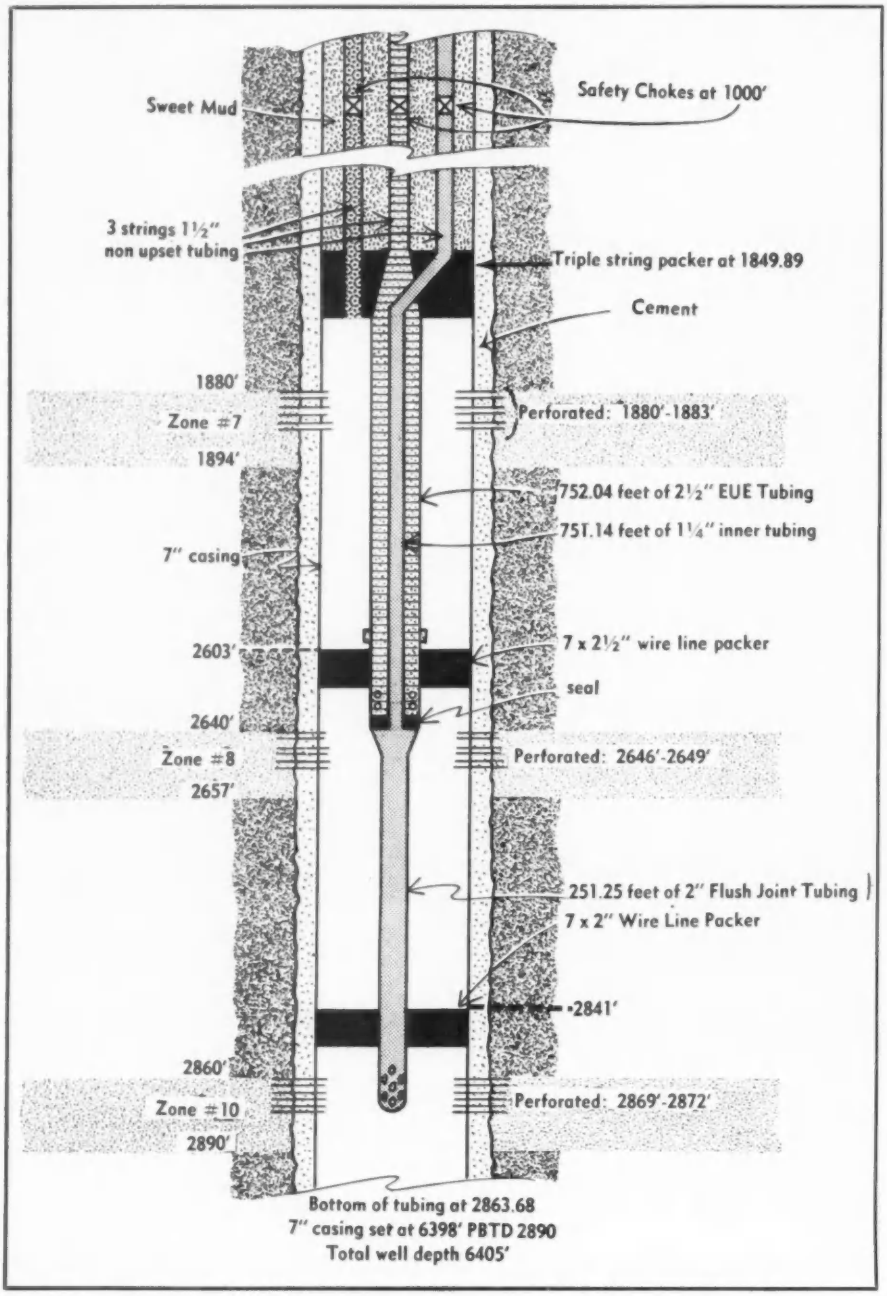


Fig. 1—Schematic diagram of triple completion with three parallel tubing strings.

to gas lift one zone while the other zone was flowing or being pumped. Any number of variations are possible, and because each well becomes a problem within itself, no attempt will be made to outline the many possibilities. It should be noted that all flow is through the tubing, unless a triple or quadruple completion would be attempted by using the casing annulus for one of the flow strings. Tubing flow is preferable, especially where fluids are involved, and particularly where sand trouble might be expected. For wells located in open bays and other sites that are difficult and costly to service, it is almost essential that the annulus be left filled with mud and sealed.

Dual completions are becoming more and more commonplace, and the number will increase because conditions are becoming more favorable today as a result of better designed equipment and economic considerations. However, triple completions will remain a rarity because circumstances that will justify them will not often exist.

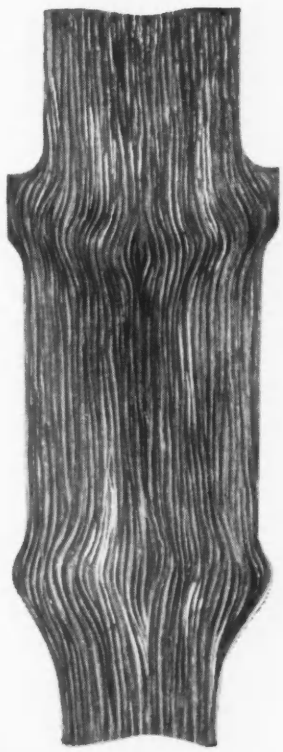
The triple completion described here made use of two regular slick joint type packers, one special three-way pin type packer, three parallel strings of 1½-inch tubing and a special three-in-one well head assembly.

Well Conditions. Alcoa's State of Texas Tract 177, Well 1, was originally completed as a dry gas well. Two and one-half inch tubing had been set on a packer inside 7-inch casing. Perforated interval was from 2880 to 2885 feet in what is known as Zone 10. Although there are several gas reservoirs in the Steamboat Pass field, only two additional zones above appeared to be commercially productive in this particular well. If only a dual completion were made, another workover would be required at some later date in order to deplete the upper reservoir. A triple completion would make it possible to deplete that portion of the three reservoirs drained by this well with only one workover. Limited production history has pointed to depletion type reservoirs; consequently, no great volumes of fluids would be produced. There has been no indication of tubing corrosion in the Steamboat Pass field; hence, this aspect of production has constituted no problem.

Experience gained from three previous dual completions employing parallel tubing strings pointed to a successful installation because the problems were similar. Therefore, equipment selected was of similar type and manufacture, except for a few specially designed items. The two lower packers were regular stock items and involved no changes. The upper packer differed from the others previously used in dual completions in that a safety joint was incorporated in it, and the head was built with three instead of two outlets. Of course, the well head equipment was specially designed and constructed as shown in Photos 1 and 2.

The Workover. Zone 10 in the State Tract 177, Well 1, had at times produced small amounts of water, although it was originally completed as a dry gas well. Therefore, after the well was killed and tubing and packer removed, it was squeezed cemented as a precaution against future water channeling.

Zone 10 was reperforated and a drill stem test made. The lower packer shown in Figure 2 (size 7-inch by 2-inch) was then set at 2841 feet with



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The proper selection of the type of rod, the correct size or combination of sizes are of the first importance when considering a new rod string. Your Axelson expert in pumping will be glad to study this or any other production problem with you. He can help you increase b/d at lower cost.

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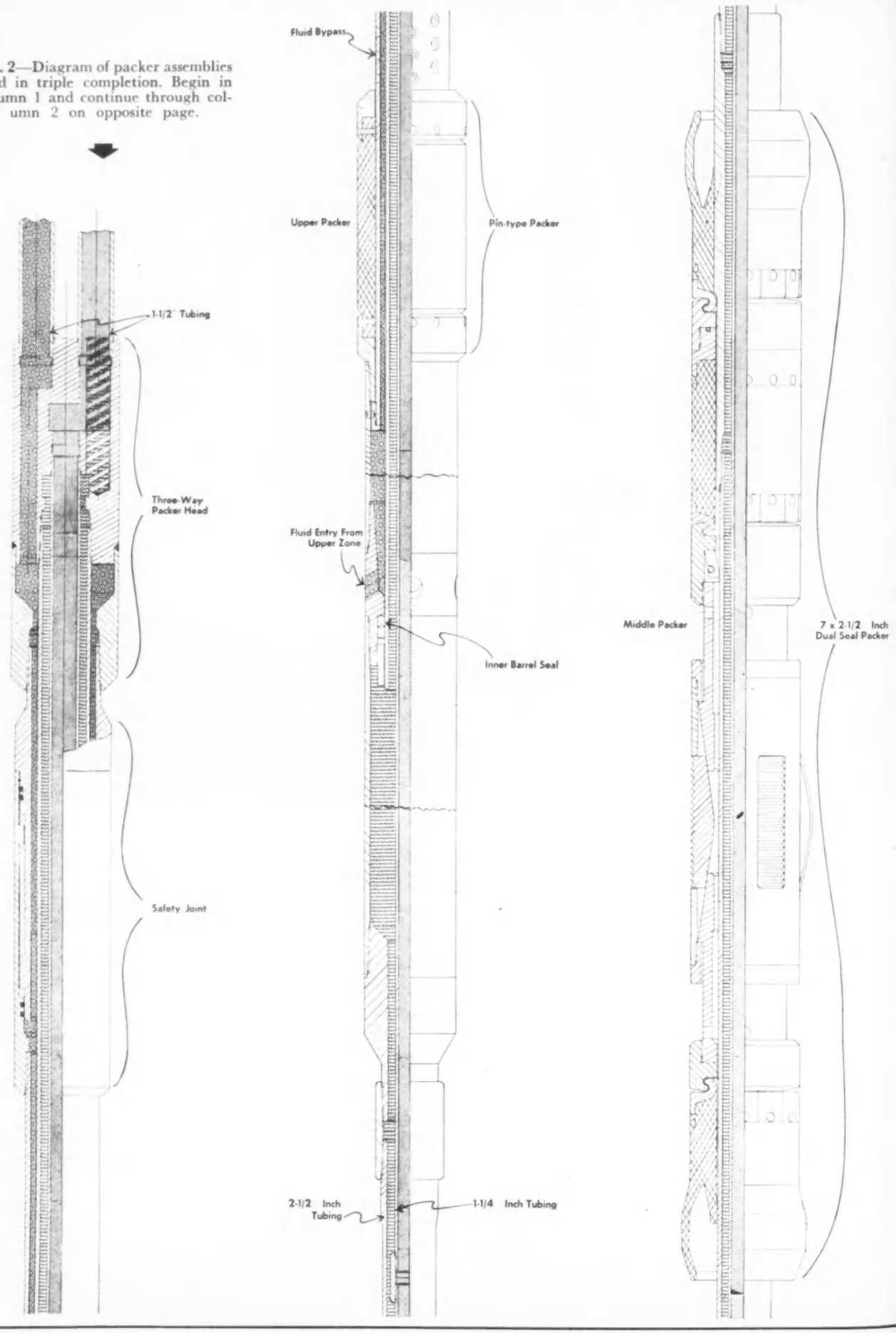
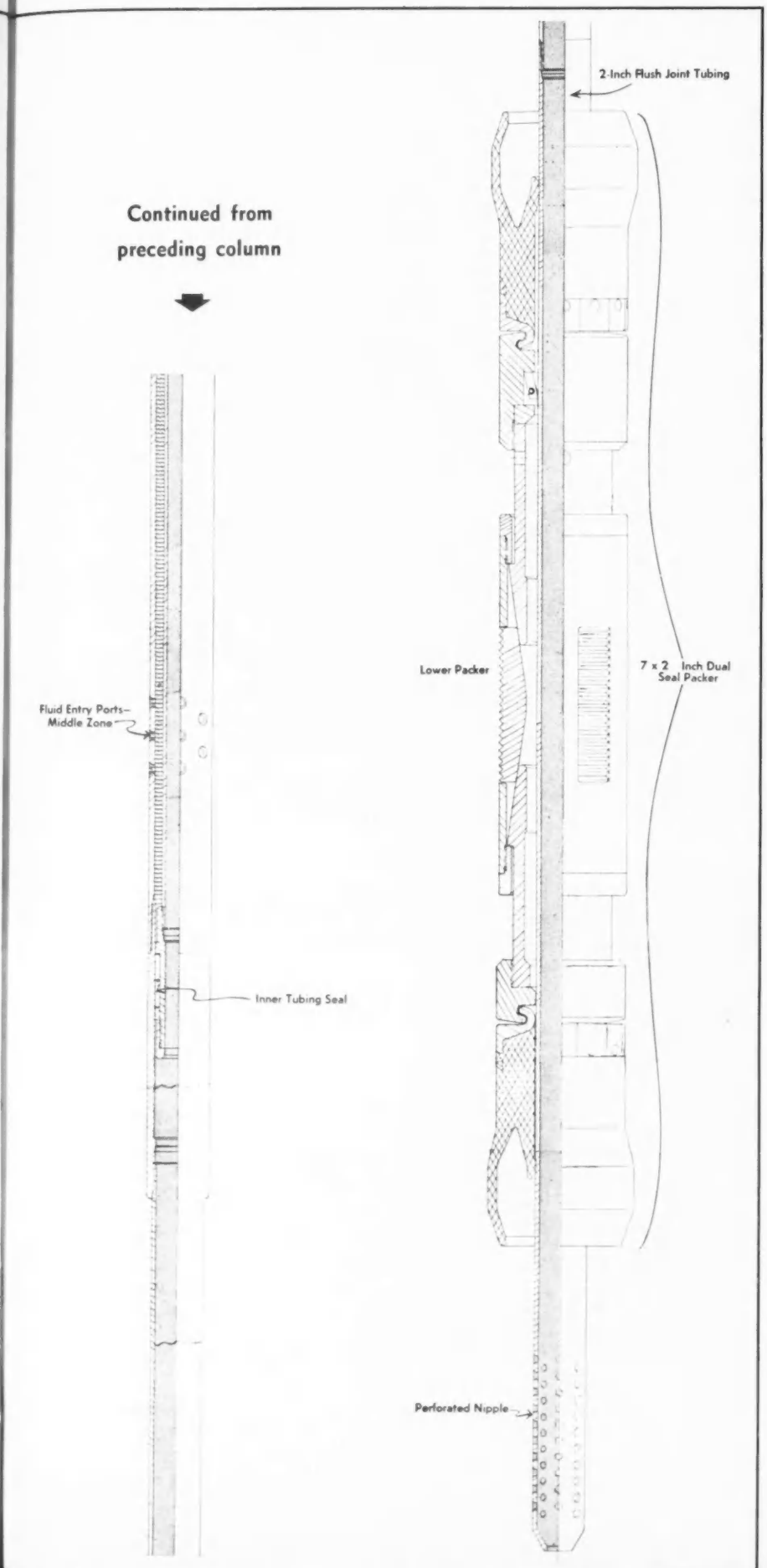
Fig. 2—Diagram of packer assemblies used in triple completion. Begin in column 1 and continue through column 2 on opposite page.





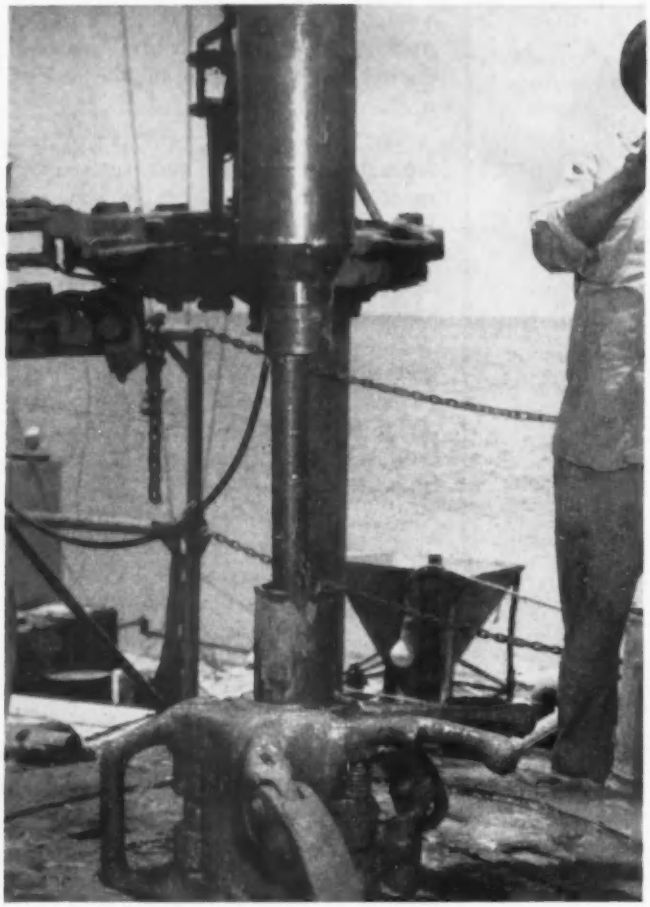
a blank stinger installed in it. This packer then served as a bridging plug during the remainder of the workover.

The 7-inch casing was perforated from 1940-1941 feet and squeeze cemented using a retrievable retainer. Circulation was established up to the surface casing with the first batch of cement. Two additional batches of cement were squeezed through the perforations before the desired squeeze pressure was obtained. Cement was drilled out of the casing, perforations made from 1880-1883 feet and a drill stem test made using a straddle packer tool. Following this successful test, casing was perforated from 2646-2649 feet and a similar production test made. The well was now in mechanical shape for the completion.

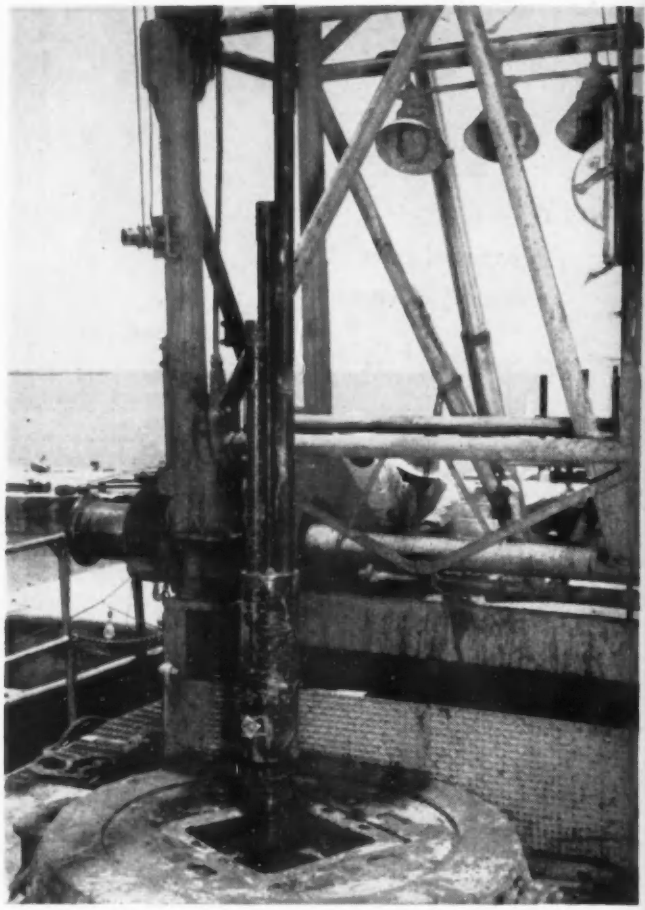
How Equipment Was Run. The blanking stem was removed from the lower packer and a trip made with two joints of flush joint 2-inch tubing. This tubing was run through the packer to simulate the condition at final completion. A pressure test was made on the packer which tested satisfactorily. The second or middle packer, size 7 by 2½-inch, was run in on the workover tubing and set at 2603 feet.

Referring to Figure 2, the lower and middle packers were set and the well was ready for the last trip in the hole with the 1¼, 2 and 2½-inch tubing and the upper packer, all of which are suspended by the three parallel strings of 1½-inch tubing. As shown, the bottom of the string is 2-inch flush joint pipe so that it can pass through the middle packer and seal off inside the lower packer. At the top of the 2-inch tubing is a special seal assembly (indicated in Figure 2), which has a 2½-inch external upset end connection on top and designed to seal around an inner stem that has a 1¼-inch connection on top. This assembly effects a seal between the middle and lower zones inside the tubing.

The 2½-inch tubing was screwed into the special seal assembly and the proper amount of 2½-inch was run in the hole so as to place the upper packer at 1850 feet. With the 2½-inch tubing supported in the rotary, the seal stem was made up on the 1¼-inch tubing which was then run inside the 2½-inch and spaced. The upper packer was then picked up and



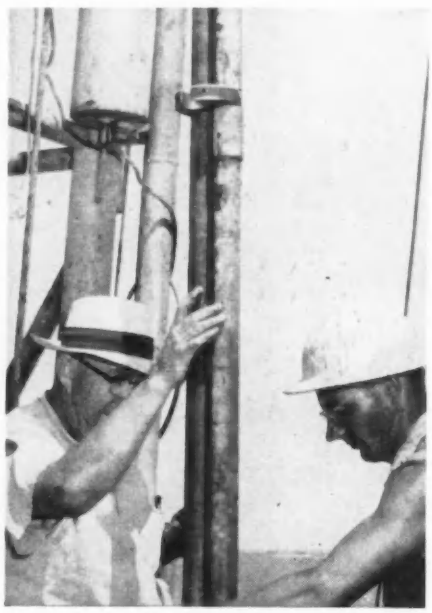
3 **CONNECTING UP** bottom of top packer to 2½-inch tubing with 1¼-inch string inside.



4 **TOP OF UPPER PACKER** assembly showing the three-way head.

the 1¼-inch tubing screwed into the 1¼-inch inner stem of the packer. The packer was then screwed into the top of the 2½-inch tubing as shown in Figure 2. It should be noted that the 1¼-inch tubing is free to move downward in relation to the 2½-inch tubing. This feature is necessary to compensate for the travel and collapse of the upper packer. Therefore, the 1¼-inch tubing had to be spaced carefully so that the stem would be at the proper place in order to seal off and would not shoulder down completely before the upper packer was set.

Photo 3 shows the upper packer ready to go into the hole. The entire assembly was carried in on one of the 1½-inch strings using one set of regular elevators and slips. Consequently, this carrying-in string had to be longer than the other two strings at all times so that when it was lowered and set on slips, only the one string of 1½-inch tubing extended through the rotary. In this manner, the next joint of pipe can be picked up in the elevators and screwed into the joint



5 **SPECIAL THREE-WAY CLAMP** used to hold three parallel strings together.

setting on the slips. The entire assembly was then picked up until the top of the other two strings are just above the rotary. Joints are made up in these two strings and the assembly lowered and set in the slips again as described above. This same procedure was followed until bottom was reached.

It should be noted at this point that the controlling factor in this parallel type of completion, be it dual or triple, is the strength in tension of the carrying-in string. In addition to the weight being suspended, an additional allowance must be made for drag of the upper packer and the friction hold of the lower packer or packers on the slick joint. This is an important point and must be considered at all times in order to make a successful setting.

Special clamps were made to hold the three strings of tubing together. Time did not permit the manufacture of a split clamp similar to the ones used in previous dual completions. These three-way clamps were made by drilling holes in a round, ¾-inch plate and installing set screws to hold the clamp in place on the pipe. Therefore, it was necessary to slide the clamps up on each joint in the carrying-in string and stab the

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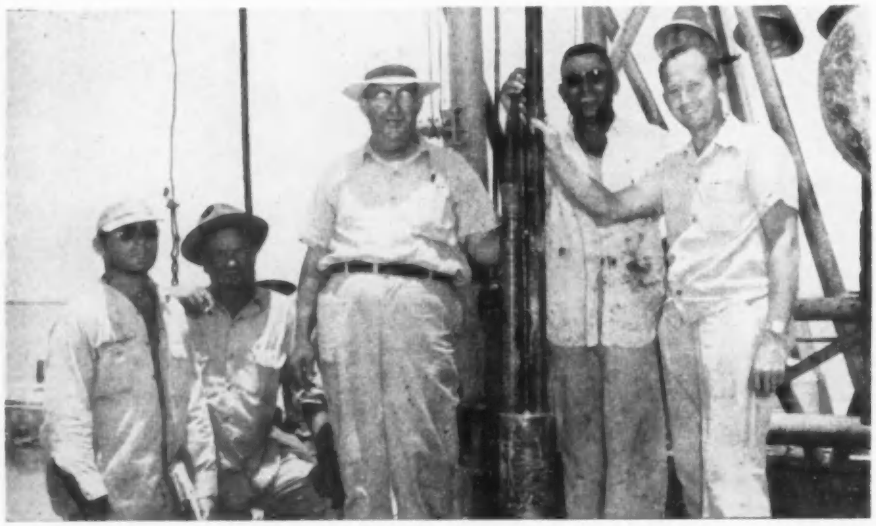

6 **THEY WERE RESPONSIBLE** for running the triple completion with three parallel strings. Left to right: Bill Walling, Alcoa engineer; John Still, Manning & Nance tool pusher; Baker Richardson and M. E. Tilton, Brown Oil Tools, Inc., and Royal Reiss, Alcoa superintendent.

other two joints down through the clamps. This procedure was slow, but otherwise proved to be satisfactory. A clamp was installed on every joint of tubing.

Spacing and Washing-in Procedure. In order to check measurements and properly space the tubing, the string was lowered until the bumper sub on the 2½-inch tubing was down against the middle packer. The string was picked up in the clear again and the proper space nipples installed. The blowout preventers were stripped off and the tubing pack-off assembly stripped down over the tubing.

The string was then set on slips inside the pack-off assembly and the first christmas tree installed. The carrying-in string was selected to be the tubing leading to the lower zone so that it would be the lowest tree and the other two trees would be installed in the same order as the zones being produced through each one.

After the trees were installed, the string was raised so that the lower end of the tubing was clear of the packers. Mud was then displaced from each tubing string with water. Mud could be displaced out of the lower zone tubing string only as far down as the 2-inch tubing because in the present position, the 1¼-inch tubing was not sealed off. The assembly was lowered slowly until it was in place. A study of Figure 2 will show that the weight of the entire assembly, except the small amount suspended from the tubing head and the amount required to expand the upper packer, is supported by the middle packer. In the set position, the following conditions exist:

- The lower packer seals off around the 2-inch tubing and against the casing, thereby, separating the middle and lower zones at that point.
- The special seal assembly seals around the 1¼-inch tubing and so separates the middle and lower zone at that point.
- The middle packer seals off around the stem and against the casing, thereby separating the upper and middle zones at that point.
- The inner barrel of the upper packer is sealed off by chevron packing around it and so separates the upper and middle zones at that point.
- The upper packer seals against the casing and thereby separates the hydrostatic head of fluid from the upper zone.

Each zone was swabbed in separately and cleaned. Following production tests, a storm choke was installed in each zone at 1000 feet.

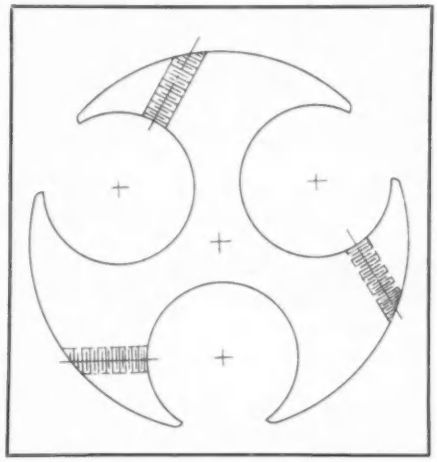

Fig. 3—Special three-way clamp used to hold parallel tubing strings together.

Future Parallel String Completions. Past successes in making multiple completions with parallel tubing strings, including a recent completion using two strings of 1½-inch tubing inside 5½-inch casing, point the way for similar jobs. Multiple completions of this type are contemplated in wells as deep as 9000 feet where oil and gas distillate are invoved. **—The End.**

About the Author

ROYAL W. REISS has been superintendent of Aluminum Company of America's Mining Division at Port Lavaca, Texas, since March 1950. He graduated from the University of Oklahoma in 1934 with a B.S. degree in petroleum engineering. Following graduation he joined Humble Oil & Refining Company as a roustabout in the Conroe (Texas) field. In 1936 he was made a junior engineer at the Sugar Land field. He also served in this capacity at the Friendswood and Dickinson fields in Texas. Then after a year in mud logging in Humble's Louisiana Division, he became district engineer in Humble's Colorado (Texas) District. During World War II he was in the U. S. Navy and was discharged in 1946 as a lieutenant. He rejoined Humble at Flour Bluff as district engineer and then moved into the Houston office. Following service in the marine equipment division at New Orleans and a stint as division equipment engineer at Corpus Christi, he resigned in 1950 to join Alcoa.

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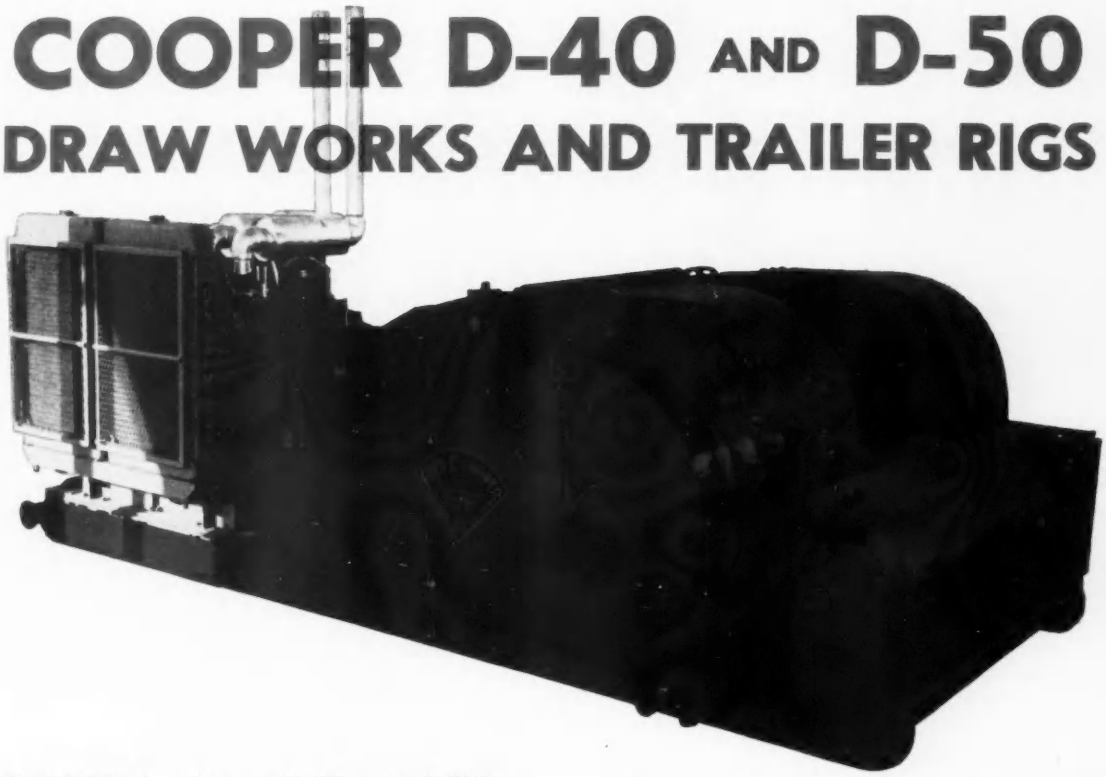

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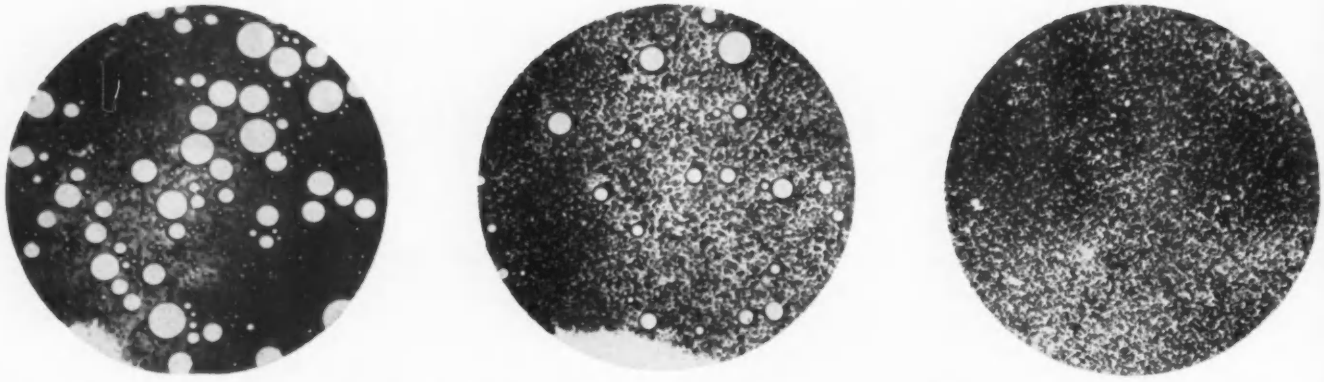


Fig. 1—Three typical oil emulsions having different water drop sizes. In the very loose emulsion at left the size of water particles varies widely. In the center emulsion, the size of water particles are more uniform and in the tight emulsion, right, are shown very small, uniform water drops.

Take a Look at Treating Oil Emulsions

• Emulsion treating has come a long way from the "fire-under-the-tank and washing-powder days."

• Five important steps lead the way to higher quality pipe line oil.

By **WALTER E. HUFFMAN,** Black, Sivalls & Bryson, Inc., Oklahoma City

THERE ARE FIVE important steps essential to the proper treatment of crude oil emulsions: (1) chemical injection, (2) separation of gas and free water, (3) application of heat, (4) filtering, and (5) settling. Order of these operations may be rearranged to suit a particular problem, or modifications may be included. Where the emulsion is not unusually complex, some of these steps even may be omitted. However, experience indicates that the order given produces best results for difficult emulsions.

These five treating steps are the outgrowth of continued study of the problem and development of equipment to incorporate these separate functions. Even though it is an old problem, emulsion treating still remains an art to many and at best only loosely defined scientifically. An examination of a typical wellstream sample under the microscope shows oil, water droplets, and solids, such as sand, undissolved salts, or metallic oxides. Not all of these appear in every wellstream sample, but water droplets are almost always present.

Approximately 90 percent of all crude oil emulsions consist of fine water droplets dispersed in the oil. Occasionally, oil-in-water emulsions are found and the yields of good oil from these are usually very low and uneconomical though often necessary to recover. Dual emulsion systems containing both the water-in-oil and oil-in-water type have been found. These are quite rare and the usual procedure is to treat them as the water-in-oil type emulsion.

Most wellstreams contain water droplets of varying size. If these collect together and settle to the bottom of a quiet sample within five minutes, they are called "free water." This is an arbitrary definition, but it is generally used as a basis for designing equipment to remove water that will settle out rapidly.

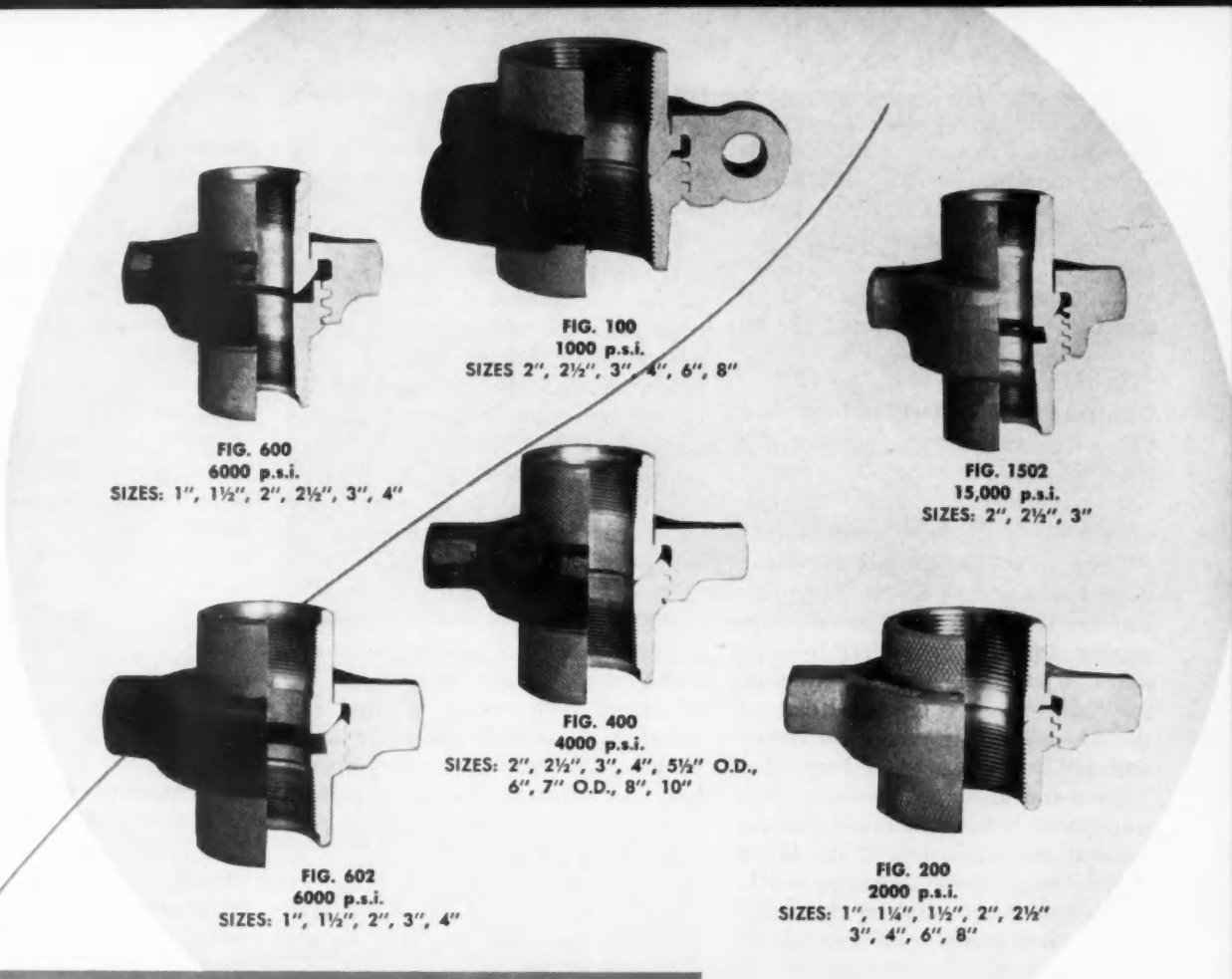
If the sample is left standing, water will continue to settle to the bottom. If enough time is allowed, all of it may settle out from the oil. In many cases, time is an important and costly item, thus it becomes necessary to devise means that speed up the settling process.

Frequently, water droplets remaining after the free water has separated out are too small to settle out without some treatment. This type of emulsion is a very stable or "tight" emulsion. If the water droplets vary in size considerably and most of them are relatively large, the emulsion is an unstable or loose emulsion.

Treating is simply a procedure that has been devised to separate crude oil from the water and foreign material picked up in the reservoir. When crude flowing from the well is treated, the emulsion is "broken" and good oil separated from water and any sediment produced with it.

When water and oil are produced together from a formation, the stream always contains sand, carbon, carbonates, sulfates, and many other organic and inorganic materials. These foreign materials become more important as the fluids churn their way "up the hole" because tubing restrictions, well chokes, gas lift valves, or pump agitate and blend the oil, water and foreign material together. The greater the agitation, the smaller the water droplets become.

Foreign materials, particularly those



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soluble in the fluids and sometimes suspended in the stream, act as emulsifying agents to increase the strength of the film surrounding the water droplets. No emulsion would be stable without the presence of an emulsifying agent. Two things are necessary to produce a stable emulsion of oil and water: (1) agitation and (2) an emulsifying agent.

Emulsion characteristics. Important physical characteristics of an emulsion are: (1) drop size, (2) film strength, (3) percentage of water, (4) differential density and (5) oil viscosity.

DROP SIZE: The drop size is a very important aspect of the treating problem for the following reasons. First, smaller droplets take longer to settle out. Consider two drops, for instance, the diameter of one being half that of the other. The smaller droplet weighs one-eighth as much as the larger, but has one-fourth the surface area. This means that it has only one-eighth the gravitational attraction of the larger one, yet its frictional resistance to falling is one-fourth that of the larger one. Under equal conditions, therefore, it would take much longer for the smaller droplet to settle out. Figure 1 shows three typical emulsions having different drop sizes. Second, smaller droplets have much stronger films around them, making them harder to rupture upon impact with other droplets. Third, the uniformity of drop size is important. If larger droplets are available upon which smaller ones can build, they will grow to proportions sufficient for separation much quicker than if the droplets are of uniform size. This is also shown in Figure 1.

FILM STRENGTH: Presence of some foreign materials in an emulsion increases the strength of the film surrounding a drop of water. Also, smaller droplets are much harder to rupture than larger ones. Film strength of a drop of water therefore will vary not only with drop size, but also with the composition of the impurities. To break the film, it is necessary to introduce chemical action and heat to weaken it. Water droplets can then merge upon contact and form larger droplets with sufficient mass to settle out of the oil rapidly.

PERCENTAGE OF WATER: The amount or percentage of water produced with the crude will also greatly affect the treating problem. A large percentage of water tends to decrease the dispersion, causes a great variation in drop size, and increases the possibility and rate of contact between water droplets. These factors promote more rapid settling.

DIFFERENTIAL DENSITY: Another factor that affects the settling time required is the relative density of the oil and water. For example, oil being produced may be as light as 45 pounds per cubic foot or as heavy as 62.4 pounds per cubic foot. Water may vary from 62.4 pounds per cubic foot (fresh water) to 80 pounds per cubic foot (salt water). An extreme example is the 17-degree API gravity oil and fresh water produced in Wyoming. This system has a differential density of only 3 pounds per cubic foot. At the other extreme is the 40-degree API gravity oil and salt water (79.5 pounds per cubic foot) produced in Michigan. This system has a differential density of 28 pounds per cubic foot. Given equal drop size, equal film strength, and equal viscosity (by heat, of course) the Michigan emulsion would treat out in less than one-ninth the time required by the Wyoming crude.

VISCOSITY: Since viscosity is a measure of a fluid's resistance to flow (or friction), it is also an indication of how easily water may settle out. A high viscosity indicates slow settling, whereas a low viscosity indicates rapid settling.

Generally, low-gravity crudes have a high oil viscosity and high gravity crudes have a low viscosity. Different oils of the same density, however, may vary greatly in viscosity. Viscosity of crudes from Talco and Seven Sisters fields in Texas are 22-degree API. The Talco crude has a viscosity of 340 Saybolt seconds Universal, whereas the Seven Sisters field crude has a viscosity of 69 SSU. Other factors being equal, the Talco crude would "drag" or hold up the droplets of water much longer than crude from the Seven Sisters field. One would expect to find the treating temperature for a Talco crude to be higher than that required for the Seven Sisters crude since heat is a means of reducing the viscosity.

This example illustrates why treating oil is considered an art. At the same time it explains some of the factors that must be considered along with a generous amount of field experience and field history to assure satisfactory treating operations.

Treating the emulsion. There are essentially five steps in the proper treating of crude oil emulsions: (1) chemical injection, (2) separation of gas and free water, (3) application of heat, (4) filtering, and (5) settling. In many cases it is necessary to use all five steps.

CHEMICAL INJECTION: Purpose of chemical injection is to introduce a chemical into the wellstream that will neutralize the foreign material acting as an emulsifying agent and thereby weaken the film surrounding the water droplets. To neutralize an agent that produces a water-in-oil emulsion, a new agent may be introduced that favors an oil-in-water type of emulsion. The neutralizing agent added will cause a breakdown of the emulsion and allow separation of water from oil.

Location of the chemical injection point is important to achieve best results. This point should be located far enough upstream from other treating equipment to allow adequate mixing and time for reaction. A good point for chemical injection is at the wellhead or at some other restriction such as a choke or header. At these points there is sufficient turbulence for mixing and sufficient time for the chemical to exert its influence on the emulsion before entering any other equipment. Unfortunately, not all treating problems can be solved by simply injecting a chemical into the wellstream.

SEPARATION: During the time fluid travels from the reservoir to the treating equipment, some gas and free water separates from the crude oil. This is especially true of loose emulsions and some tight emulsions that have been treated with chemicals.

It is advantageous to separate this gas and free water from the crude oil emulsion before proceeding with any further treating because: (1) removal of the gas reduces turbulence and agitation to a minimum in other equipment. This allows quiet separation of water from the crude oil emulsion; and (2) removal of free water eliminates unnecessary heating of water that has already separated from the emulsion. This reduces the heat load on the heating equipment and cuts treating costs.

EFFECT OF HEAT: Heat produces three effects upon crude oil emulsion:

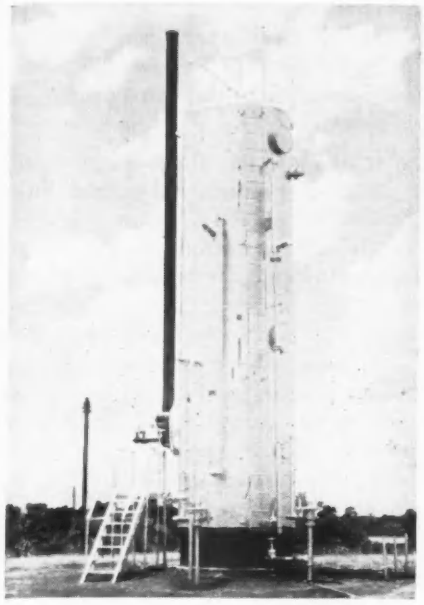


Fig. 2—Typical vertical oil emulsion treater.

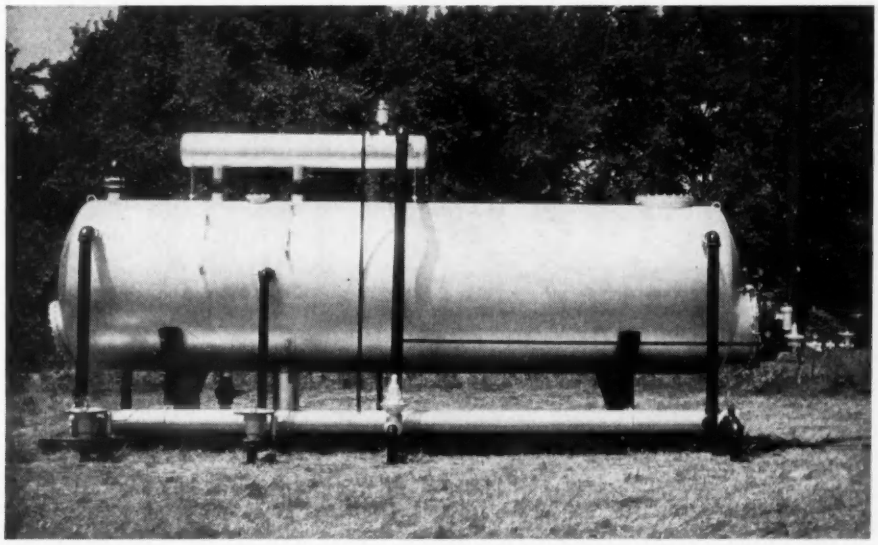


Fig. 3—Horizontal oil emulsion treater. Both types are divided into several compartments, each designed to perform one or two of the basic oil treating steps.

(1) it increases effectiveness of the chemical on the emulsion, weakening the film and aiding water droplets to merge together, (2) it reduces viscosity of the oil and oil-water emulsion, making it easier for water droplets to settle out, and (3) energy transferred to the emulsion, as manifested by the increase in temperature, increases movement of water droplets and affords more collisions between droplets per unit of time.

FILTERING: Heat alone will not reduce all emulsions to pipe line quality oil. It is often necessary to provide some filtering medium that offers a large surface upon which water droplets can collect and merge into sufficient mass that breaks away and settles out.

Excelsior has proven to be the best filter medium. Many others have been tried over a period of several years but excelsior has proved to be the most efficient. Fortunately it is also the most economical.

SETTLING: Adequate time also must be provided for settling. This should be carried out in an area having as little agitation as possible. If this can be accomplished at or near the treating temperature, the additional advantage of reduced viscosity and added chemical effect can be utilized.

These five steps in treating may be shifted in their order of application, however experience in the past has proven that the order presented produces best results. Filtering and settling are frequently carried out concurrently in the same area, and have been separated primarily for discussion purposes.

Modifications. Operators quite often modify treating process or incorporate auxiliary equipment to increase the yield or improve the quality of crudes. Most common modification made in the treating process is to increase the operating pressure. To do so would depend upon the type of equipment on the lease and its suitability for higher operating pressures. By increasing pressure on crude, more of the lighter oil fractions are held in solution and thus sustain or increase the gravity of stock tank oil. As a general rule, a decrease in gravity of one degree API results in a loss of 2½ percent of saleable oil.

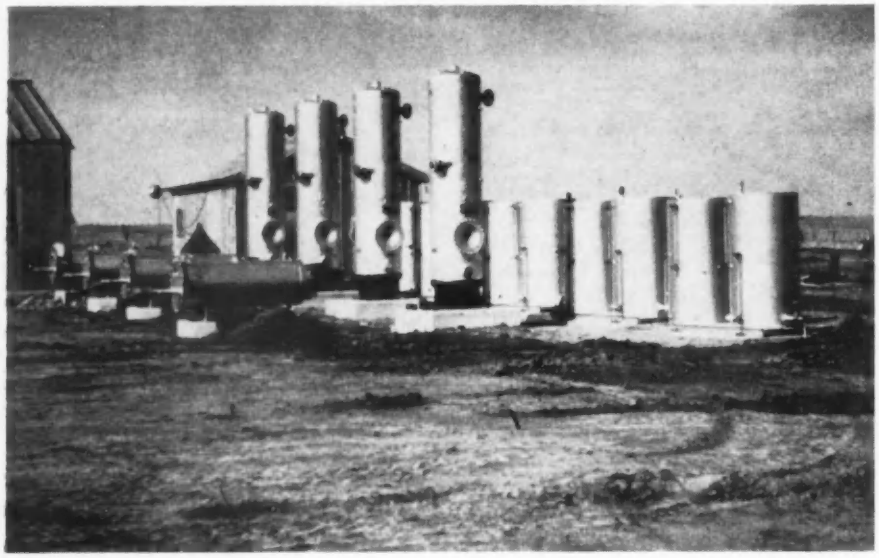
External heat exchangers are used quite often to cool down treated oil by heat exchange with the cool incoming wellstream. In this manner the treated oil is cooled down to a reasonable storage temperature to reduce weathering losses to a minimum. The incoming wellstream picks up some heat before entering the treating equipment, thus conserving heat and reducing the heating load.

Emulsion preheaters are used particularly when the crude is viscous, of low gravity stock, is foamy or contains considerable paraffin. Usually the preheated consists of a pipe bundle inserter through a manway of a treater into the hot water heating section. Use of an integral steam heating unit recently made possible the use of a steam-to-oil preheater. Purpose of the preheater in the case of low gravity viscous crudes is to lower the viscosity by adding heat so that free water may settle out more rapidly. For foamy crudes, preheating stabilizes the crude and reduces foaming to a minimum. Where paraffin is a problem, preheating aids in keeping the paraffin in solution until the oil reaches stock tanks where paraffin precipitation is only a slight problem.

Modern Methods. Early treating equipment consisted of several separate and independent units each of which performed one of the five basic treating steps. This type of treating system was referred to as the multi-unit system. It has now been largely replaced by the simpler and more efficient single unit treating system better known as an emulsion treater. The emulsion treater consists of a single vessel either vertical or horizontal, divided into several compartments or sections. Each of these sections is designed to perform one or two of the basic treating steps, thus providing a compact, easy-to-install and efficient treating system.

All emulsion treaters use the same fundamental steps in treating regardless of whether they are horizontal or vertical, or who manufactures the unit. Each different type or model has certain advantages or innovations that made it a better unit for one particular problem than another. Figures 2 and 3 are typical of the vertical and horizontal treaters available today. Emulsion treating equipment has come a long way from the "fire under the tank and washing powder days."

—The End.



GATHERING SYSTEM for a five-spot well pattern combustion experiment in Oklahoma. The small horizontal tanks left foreground are heaters followed by gas-oil separators and then the liquid gauging tanks. Building at left background is operations building that houses air compressors, control and measuring instruments, testing laboratory and office.

Here's a new secondary recovery method for thick crudes . . .

'In Situ' Combustion

FIRE AND AIR may prove the means to recover much of this nation's estimated 4 billion barrels of heavy, thick crude reserves heretofore classed as "unrecoverable." After six years' experimentation, both in the laboratory and in the field, Magnolia Petroleum Company's field research laboratory at Dallas has come up with a new method of secondary recovery for crudes of this type. It has been designated "in situ combustion" by Carl S. Kuhn and Robert L. Koch, who headed the research program, a joint project of Socony-Vacuum Oil Company, Inc., and its affiliates, Magnolia and the General Petroleum Corporation.

Principle in Brief. Heat applied to low-gravity crude lowers its viscosity so that it may mover more easily through permeable formations. For example, at 100° F. a typical 14-degree gravity API crude has a viscosity of 630 centipoise. At 175° F., viscosity is only 67 centipoise.

Air is injected into input wells which are ignited by electrical heaters placed opposite the producing formation. Combustion is controlled by the rate of air injection. Oil in the vicinity of the input well is actually set afire, and herein the name "in situ" was derived, meaning "in place." Heat is transmitted through the reservoir, causing the heavy crude to "thin out," permitting the injected air to force it through the formation and into the bore hole of offset producing wells.

Field Test. A five-acre tract overlying a 30-acre sand lense in a southern Oklahoma field containing heavy crude was selected for a pilot test. Gravity of the crude was 18.5° API; viscosity at 60° F. was 7413 centipoise. Top of the sand was at 180 feet below surface, and sand thickness was from 15 to 18 feet. Three wells were involved in the test: two producers located 40 feet apart, separated by one injection well half way between and inline with the two producing wells.

Air was injected into the input well at about 90 pounds per square inch pressure for 23 days, when some of the air was recovered from the producers. Injected air had no effect on production of this heavy crude in the two offset wells. At this point, the input well was ignited electrically, and air continuously injected at pressures which varied from 120 up to 150 psi. At the end of five days, carbon dioxide was detected in one of the offset producers located 20 feet away, and after 55 days, the combustion front broke through to the producing well. Analysis of the gas indicated that about 9.5 barrels of crude were burned to produce 81 barrels of formation oil during the 55-day trial. About 2.3 million cubic feet of air were injected into the input well.

Laboratory Work. Much has been written about various methods of adding heat to the formation in order to increase the viscosity of low-gravity crudes to make them move through the reservoir with less resistance. Feasibility of actually setting oil in the formation on fire to provide the necessary heat was proven only after several years of tedious laboratory experiments. Tubes of various sizes, placed horizontally and vertically, were packed with sand, heavy oil and water. Air was injected into one end of the tube and oil was ignited electrically. Data on all phases of the experiment were taken and studied so that the researchers could evaluate the idea. It looked good in the laboratory, and the project was transferred to the field.

What's Ahead. Success of the field experiment in southern Oklahoma justifies further investigation. Accordingly, the project will be expanded to include one or more additional trials in which a five-spot patter similar to that of water-flooding, will be utilized. Climbing demand for crude oil certainly merits continued investigations such as this, and with the increasing number of patents issued on the thermal recovery of oil, undoubtedly this line of approach will find increased attention from industry in the immediate future.—**The End.**

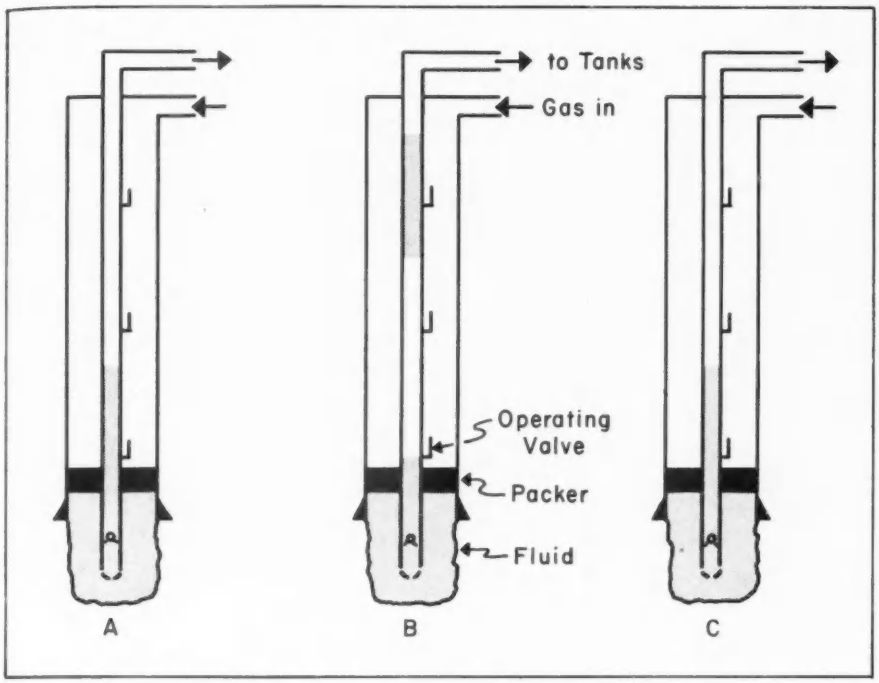


Fig. 1—Schematic diagrams illustrate a complete cycle in intermittent gas lift.

Why Worry About Port Size In Gas Lift Valves?

Because on intermittent systems, size influences . . . (1) production (2) efficiency and (3) valve spacing.

By B. J. (DUSTY) RHOADS, JR.,
Odex Engineering & Equipment Company, Odessa, Texas

SIZE OF GAS lift valve ports affects the maximum production available from intermittent systems by influencing the velocity of a fluid column produced in each cycle. If it is assumed that productivity of the well is high, the limit to the volume of fluid that can be produced during a given interval is determined by the amount of fluid produced each cycle and the number of cycles repeated during that interval.

One complete cycle of intermittent gas lifting is illustrated in three diagrams of Figure 1. Fluid has accumulated above the operating gas lift valve in diagram "a." In the second diagram, the operating valve has opened due to an increase in annulus pressure, and the fluid column is on its way to the surface. The valve has closed in diagram "c," and fluid has again accumulated above the valve. At this point, the cycle is completed and the valve is ready again to repeat the operation.

The number of cycles obtained in a given period of time is dependent upon the velocity of the fluid column. The quicker a head of fluid can be delivered to the surface and pressure required to produce this head is bled off, the sooner another head can be started. Velocity is quite naturally limited by the gas capacity of the port in a gas lift valve.

Velocity of one barrel of water for various port sizes, are plotted in Figure 2. Mechanics of a head of fluid in intermittent gas lift is not as simple as it might seem at first glance. Velocity of one barrel of water plotted in Figure 2 is average velocity. Actual velocity of a fluid head starts at zero, reaches a peak, then declines to some value. This change in fluid velocity in the tubing string is demonstrated in Figure 3. At point A, fluid has accumulated, but the valve has not yet opened. From point A to point B, the valve has opened and fluid begins to accelerate. At point B, the velocity becomes such that acceleration decreases because of increasing friction due to increasing velocity. However, from Point B to C, the head continues to accelerate but to a lesser degree. From point C to point D there is a deceleration due to increasing resistance to flow of gases because of the increase in length of tubing through which the gas must flow. There is still a further deceleration when the valve shuts off from point D to E. The mathematical formula for vertical fluid velocity in tubing may be written as follows:

$$V = \sqrt{2gh}$$

where:
V = velocity in feet per second.
g = acceleration constant.
h = head in feet.
$h = H_t - H_1 - H_2 - H_3$.
H_t = Head at base of tubing or at operating valve.
H_1 = Head of fluid (feet X gradient).
H_2 = Friction head at velocity V.
H_3 = Friction head due to gas flow.

All factors with the exception of H_1 (feet of fluid) are variable. It is obvious that the larger H_t, the greater will be h, and therefore, velocity will be greater. With large ports, H_t can be maintained at high values because less differential is required to pass the volume of gas sufficient to maintain velocity near maximum. A port size equivalent to the size of tubing would be most efficient, since no differential would be required to pass energy

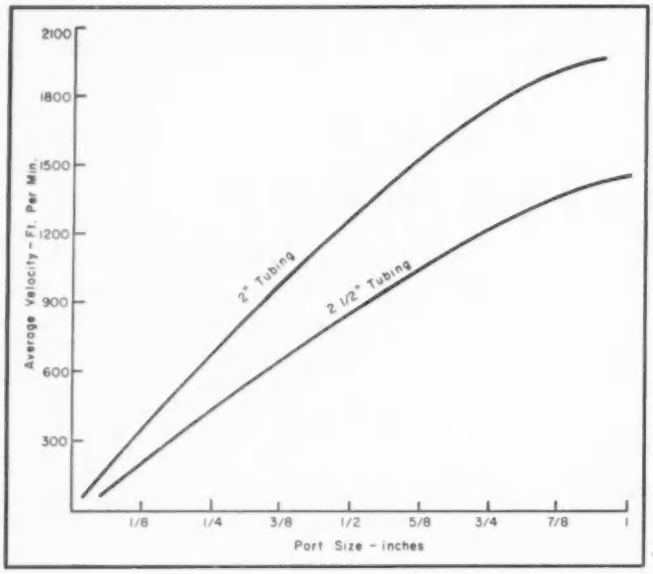


Fig. 2—Average velocity of one barrel of water in tubing for various valve port sizes.

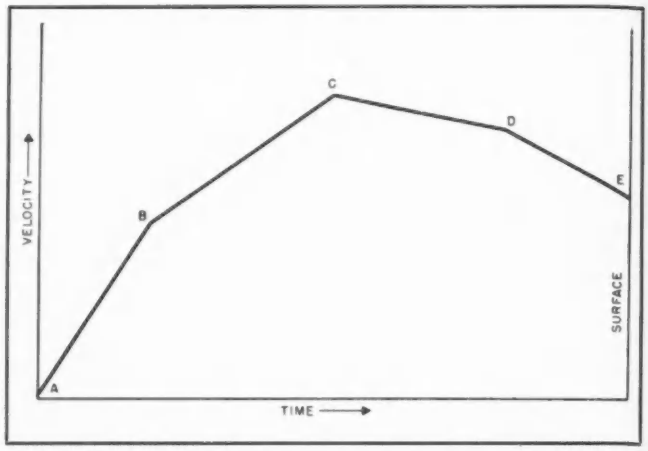


Fig. 3—Characteristic velocity curve for a slug of fluid lifted from bottom to surface in intermittent gas lift.

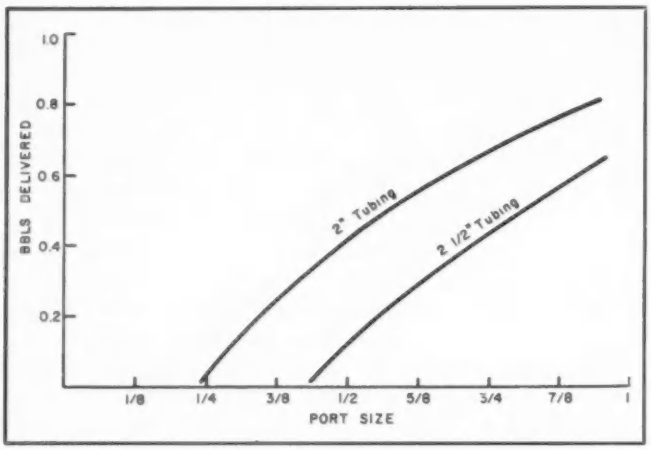


Fig. 4 (left)—Volume of fluid delivered at surface when starting with 1 barrel at bottom. Length of tubing is 5000 feet, operating pressure 500 psi.

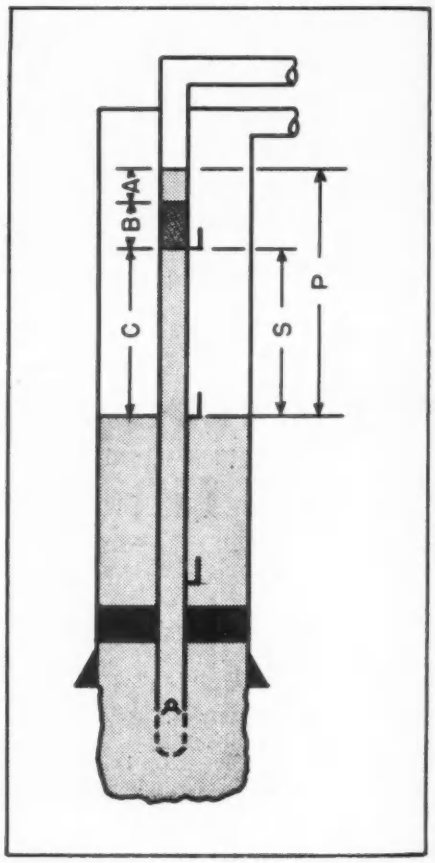


Fig. 5 (right)—Valve spacing is dependent upon weight of fluid, S, slippage, A and build-up, B.

from the annulus to the tubing, thus, no energy would be wasted.

EFFICIENCY. Large ports affect efficiency in much the same manner as it affects the maximum production available by influencing velocity. As a column of fluid starts to the surface, the bottom portion of this column begins to fall back or rain back. The less the velocity, the more time allowed for the column to drip back; consequently, the smaller the port size, the smaller the amount of fluid delivered to the surface as compared to the amount at the beginning. This is shown in Figure 4 with one barrel of water at the bottom to begin with. At very low velocities or small port sizes, no water is delivered. All water drips back and gas breaks through. As velocity increases, the amount delivered approaches the one barrel at the start of the cycle. Therefore, larger port sizes mean greater efficiencies because of less slippage at greater velocities.

VALVE SPACING. Velocity of the fluid column is again the limiting factor as far as spacing is concerned. Spacing formulae are devised to ascertain that a well can be unloaded, and take into account slippage and productivity.

Capacity of intermittent lift is limited to a certain amount of fluid, depending upon depth and available gas pressure. As depth increases, more time is required to complete a cycle, and the number of cycles per day is decreased. As pressure decreases, so does the amount of fluid that can be lifted per cycle.

Since the capacity of the lift is limited, there is little use to design the installation to lift fluid beyond the capacity of this type of lift. Figure 5 illustrates the reasoning behind valve spacing. The distance between valves 1 and 2 (or S) is dependent upon P, weight of the fluid column A+B+C. Slippage is represented by the fluid column A. B is the build-up or "feed-in" between heads, and C, of course, is the fluid between valves. Since A is a function of velocity and B is a function of time, it is logical that with a larger size valve port, A and B will be less, and C, the distance between valves, may be larger. For this reason, large ported valves can be spaced farther apart, requiring less valves in the tubing string.

—**The End**

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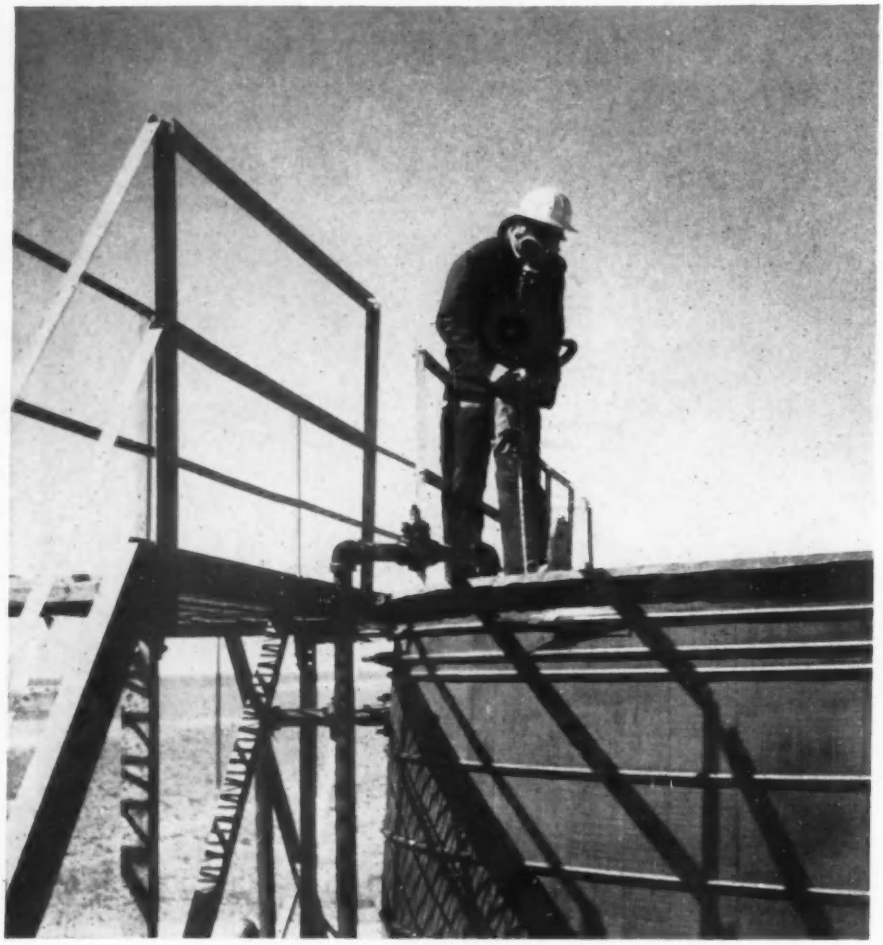

CANNISTER-TYPE GAS MASKS when properly fitted and used will prevent blackouts and paralysis of field personnel gauging tanks containing sour crude.

How You Can Combat Hydrogen Sulfide Hazards

A deadly enemy of oil field workers, this gas can paralyze or kill quickly. The answer? Education on precautions to be taken and equipment to be used.

By GEORGE AUSTIN, Safety Director, Shell Oil Company, Ltd., Toronto

WHEREVER CRUDE oil containing hydrogen sulfide is produced and stored, field personnel and others who may come within close proximity of this gas should be made acutely aware of the hazards and instructed in the proper precautions to escape its deadly effects. As in all safety work, education in avoiding the hydrogen sulfide hazards presents many difficulties, and an additional responsibility is placed on foremen and superintendents in the field where this gas occurs.

The principal hazard to personnel is asphyxiation, or poisoning by inhalation. Hydrogen sulfide is a colorless, inflammable gas having an offensive odor and a sweetish taste. It is highly toxic, and doubly hazardous because it is heavier than air. Its offensive odor, like that of rotten eggs, has been used as an indicator by many oldtimers in the oil fields, but it is not a reliable warning of the presence of the gas in a dangerous concentration because people differ greatly in their ability to detect smells.

Where high concentrations are encountered, the olfactory nerves are rapidly paralyzed, denuding the sense of smell as a warning indicator. A number of examples have been reported where field men have been knocked out, and when revived declared they had had no warning either by smell or otherwise. In fact, they did not know they had been "out" until revived.

Toxicity. Hydrogen sulfide is an irritant, and an extremely toxic gas. It is almost as toxic as hydrogen cyanide, and between 5 and 6 times as toxic as carbon monoxide. Contrary to general opinion, employes in the oil fields where hydrogen sulfide is present, may become so accustomed to the smell of the gas as not to notice it. However, a tolerance to its effects is never acquired. Instead, as has been proven by experiments, a hyper-susceptibility may result from exposure to the gas.

Toxic effects produced by hydrogen sulfide vary considerably with the concentration encountered. In low concentration it has an irritant action on the air passages and mucous membranes. In high concentration it has a systemic effect, and in acute poisoning death is as rapid as in poisoning by cyanide.

Surveys have shown that with but few exceptions, hydrogen sulfide is present in toxic concentrations in most crude oil storage tanks. Field employes have been suffering from the results of exposure to low concentrations without realizing what was the matter. Many instances have been reported where cases of asphyxia occurred at storage tanks and wells. Connection men have been overcome in tanks, and gaugers have sometimes been overcome so suddenly that they have fallen off tanks. Sightseers have been overcome as a result of approaching too close to storage tanks, or depressions around storage tanks in which gas has accumulated.

One instance occurred recently in a district where it has been the opinion that hydrogen sulfide was present

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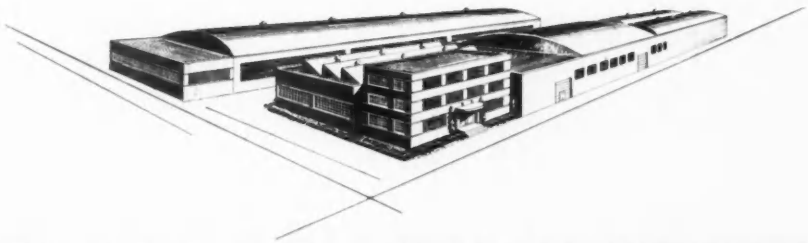

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only in minute quantities, where a visiting sightseer, a small boy and a dog, were observing the initial tests at the well. While the test was under way, they were seen to walk over near a field tank. Suddenly the young lad collapsed. The father picked him up immediately and rushed him back to the toolpusher's shack where he was revived. About the time the young boy revived somebody thought of the dog. The dog was not so lucky. He was dead.

Another experience cited is one in which a man lost consciousness while driving his car. The car passed out of the path of the gas before coming to a stop, where the man regained consciousness. In another instance, as many as 14 cases of unconsciousness were reported in closing-in one well. In another operation, all four men on a rig either lost consciousness or were affected so seriously that the rig had to be shut down. In some areas, the concentrations are so high, that where employes are overcome, they sometimes have little or no chance of survival unless immediate expert artificial respiration is applied.

Symptoms. Poisoning produced by different concentrations may be divided into two groups.

- The acute case results in almost instantaneous asphyxia with seeming respiratory paralysis. Acute poisoning, or strangulation, may occur after even a few seconds inhalation of high concentration, and results in panting respiration, palor, cramps, paralysis and almost immediate loss of consciousness with loss of speech, and with no other warning than a cry. Death may follow with extreme rapidity from respiratory and cardiac paralysis. One sniff of a sufficiently high concentration may bring this about.

- The second type, called subacute, results in irritation, principally of the eyes and the respiratory passage followed by deep depression of the central nervous system.

A concentration of a few hundredths of 1 percent higher than that causing irritation, can cause asphyxia. In other words, there is a very narrow margin between consciousness and unconsciousness, and between unconsciousness and death. Where high concentrations cause respiratory paralysis, spontaneous breathing does not return unless artificial respiration is applied. In less severe poisoning, convulsions and shortness of breath have been noted as mild symptoms. In sub-acute poisoning, the main symptoms are those of irritation to the eyes and respiratory tract, ranging in severity from mild conjunctivitus to temporary blindness. In many cases these symptoms are extremely painful.

Treatment. As hydrogen sufide in the blood oxidizes rapidly, symptoms of acute poisoning pass off when inhalation of the gas ceases. It is important, therefore, to get the victim to the fresh air as quickly as possible. He should be kept at rest and chilling should be prevented. If respiration is slow, labored or impaired, artificial respiration is necessary and should be supplemented by administration of oxygen, or a mixture of oxygen and carbon-dioxide.

Every man working around crude oil containing hydrogen sulfide should be able to give artificial respiration by the back-pressure-arm-lift method, as most persons overcome by this gas may be revived if artificial respiration is applied before the heart action ceases.

In acute poisoning, the persistent administration of oxygen is of great value. In all cases, victims of poisoning should be placed under the care of a physician.

Precautions. Instructive bulletins regarding the hazards and the necessity of keeping out of the gas as much as possible, should be issued. Men in charge of work should show by their own example the precautions which should be taken. Many cases of irritation are the result of carelessness, or lack of knowledge of the danger on the part of the employe and the employer. Workmen often stand needlessly on the leeward side of a wellhead, or in the streamline flow of gas. Workmen should be educated to avoid the gas whenever possible, by working on the windward side.

Under no conditions should a man stand directly over the thief hatch or gauge hole on the tank. In this regard, it is interesting to note that three out of five deaths resulting from hydrogen sulfide, in one field, have occurred to gaugers on top of tanks. Employers should furnish protective equipment and the men should be instructed in the proper use of it. Supervisors should insist on the wearing of this equipment.

FOR WORK ON THE DERRICK FLOOR: Where concentrations of hydrogen sulfide that will irritate the eyes are likely to occur, men should wear a gas-tight type of goggle. Goggles with water dams to overcome fogging and non-shattering lenses are recommended. Where low concentrations of hydrogen sulfide gas occur, suitable cannister-type masks should also be worn. Where high concentrations exist, suitable self-contained breathing apparatus should be provided, particularly during testing and swabbing operations.

FOR GAUGING TANKS: Suitable cannister-type masks should be worn bearing in mind the limitations. Here again, education of the workman is needed to insure that the wearer does not feel himself immune from all danger and stand in the streamline flow of a highly toxic gas escaping from an open vent or gauge hole. Cannisters should be used in accordance with the instructions of the manufacturers, as they know the contents of the container and the safe working time that is permissible before discarding. The life of a cannister is relatively short.

FOR WORK IN CELLARS, INSIDE OF TANKS OR IN OTHER CONFINED SPACES: Where high concentration of hydrogen sulfide may occur, men should wear self-contained equipment, or hose masks equipped with blowers. Care should be taken that the blowers are far enough away from the gas to insure an uncontaminated supply of air. As an extra precaution, a man should be designated to watch each hose and safety line to keep them from being entangled. Hydrogen sulfide detectors are available and should be used, particularly in gauging operations in order to keep constantly advised of the percentage of toxicity likely to be encountered.

Signs should be posted at the entrances to all leases where hydrogen sulfide has been encountered, advising of the presence of poisonous gas. These should be large enough to attract the attention of visitors, particularly during the test period. A constant wariness against unauthorized visitors should be maintained.

—**The End**

ACKNOWLEDGMENT

From a paper presented at the Second Annual Safety Clinic, Canadian Association of Oilwell Drilling Contractors, at Banff, Canada.

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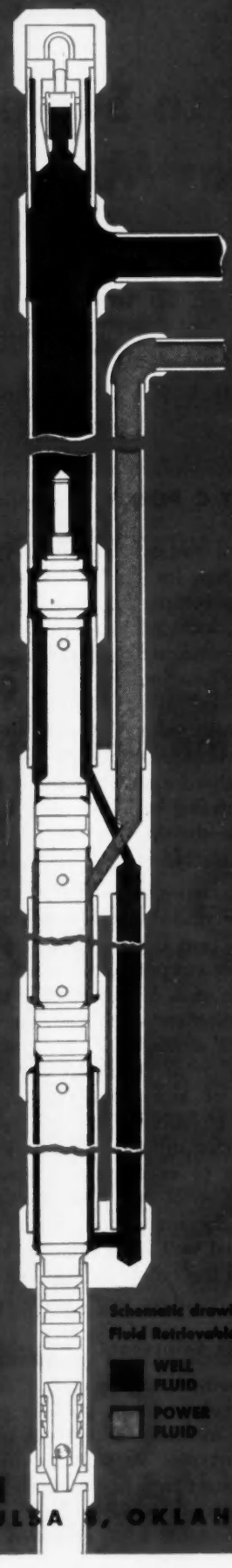

Schematic drawing of Fluid Retrievable model

How to Solve Problems in Gas Measurement

Greater accuracy will mean a more equitable settlement between supplier and user, and provide the operator with better performance data.

By DUDLEY C. PENICK, Magnolia Petroleum Co., Dallas

ACCURATE GAS measurement of intermittent flow for gas lift operations has been accomplished through the use of fast clocks on the meter chart, by specially-designed meters, by positive displacement meters, and by dual meter settings. With the increased economic value of gas, greater accuracy in measurement of gas lift gas will bring about a more equitable settlement between supplier and user, and provide the operator with better performance data.

Since injected gas for gas lift operations is intermittent, and the length of the injection cycle varies widely, the measurement problem is a difficult one. Length of a "kick," or time that the intermitter is open may be as little as 30 seconds, or in unusual cases as much as 30 to 40 minutes. Frequency of kicks may vary from once every ten minutes to once every four hours for different installations. In addition to variations in settings on different wells, it is also necessary to change the intermitter setting on an individual well from time to time, since this is the only way that the oil production from the well can be controlled.

Conventional oil field gas measurement methods, using seven-day continuous circular charts, do not give satisfactory measurement of gas used for lift purposes. A segment of a seven-day chart from a lift gas orifice meter installation is shown in Figure 1. The differential kicks recorded on the chart have no discernible area. This particular meter installation is measuring gas from a limited supply source which is serving a single gas lift well located about 1500 feet from the meter. Hourly kicks are of 2½-minute duration, but about 15 minutes are required for the gas supply to repressure the 1500 feet of line after the static pressure drop caused by the sudden surge of gas flow. This installation is typical of the measurement problems encountered in measuring gas to lift wells.

Similar problems will be encountered in measuring gas produced from gas lift wells. This gas will include all of the lift gas injected into the well plus any formation gas produced with the oil, and will be measured after separation from the oil at a low pressure. If the gas lift well is producing into a common separator with other wells not on gas lift, the intermittent flow will be superimposed upon the steady flow from the other wells.

Gas produced from a gas lift well will not necessarily come out on the same time cycle by which it was injected, and often a slug of gas will be produced in a shorter time period than the injection time. Since the volume of formation gas produced is usually relatively small compared to the volume of lift gas injected, and since formation gas can be measured only as the difference between the total gas produced and injected, a small error in either measurement could give a negative volume of formation gas. This is inherently impossible in a gas lift installation, and its frequent occurrence is further proof of the inaccuracy of most gas lift measurements.

Fast Clocks. The most apparent method of improving measurement accuracy on a gas lift installation is by the use of a faster chart drive on the meter. This increases the area recorded by each differential kick, and thereby gives a more accurate interpretation. This method is limited only by the additional expense of changing and integrating the larger number of charts required. For most field installations, it would not be practical to change charts more often than once every 24 hours, but even faster chart speeds are often very useful for test purposes.

With a 24-hour clock, the 2½-minute differential kicks of the meter installation illustrated in Figure 1 would still be only $\frac{1}{64}$-inch wide at their base. This would not be much wider than the line drawn by most differential pens. Each marked division on a standard 24-hour chart is about $\frac{3}{32}$-inch wide at the base, and this represents 15 minutes. A 24-hour chart will always give better accuracy than a seven-day chart, but the interpretation of such a chart will still be doubtful unless the kicks being recorded are at least five minutes or more in length.

Constant Cycle Assumption. Extremely fast clock speeds (24-minute, 1-hour, or 2-hour) give charts which can be easily integrated to determine the volume of gas passed on any one or more kicks of the gas lift intermitter. If it is assumed that the same volume of gas is passed in each cycle, then a standard seven-day chart can be used to determine the number of kicks, and the weekly volume computed by multiplying the number of kicks by the volume per cycle.

In some cases, a "fast chart" is run on each meter installation once every week, so that the volume per cycle is checked weekly. This method requires extra field time to run the fast charts, and may sometimes be subject to considerable error due to variations in the individual cycles. These variations may be due to mechanical failure of the intermitter or gas lift valves,

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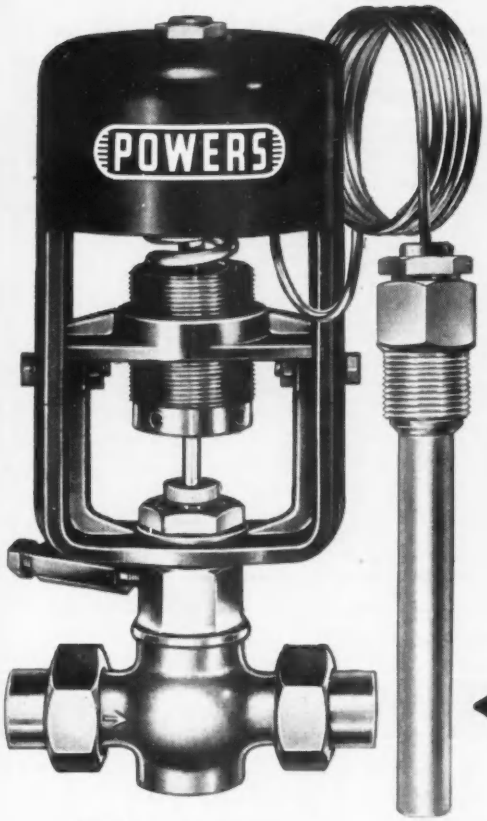

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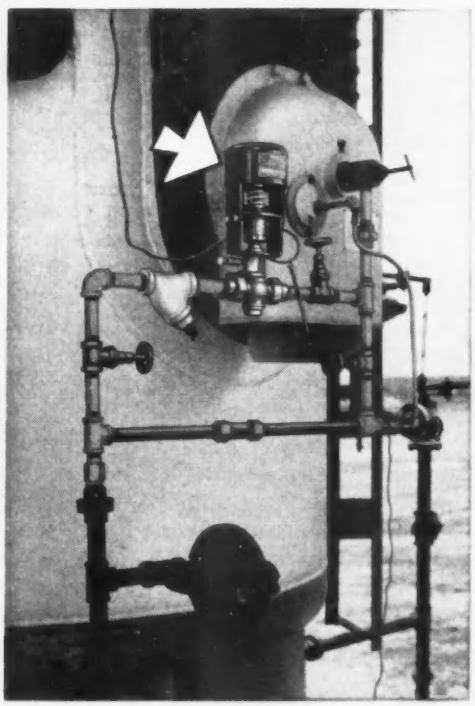

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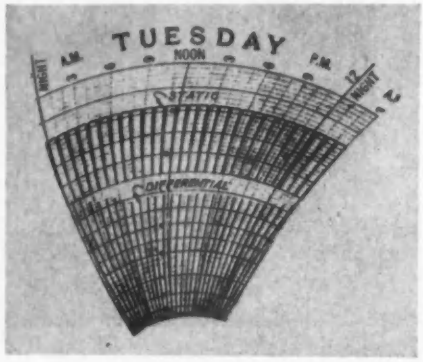

Fig. 1—Segment of seven-day charge from gas lift meter installation.

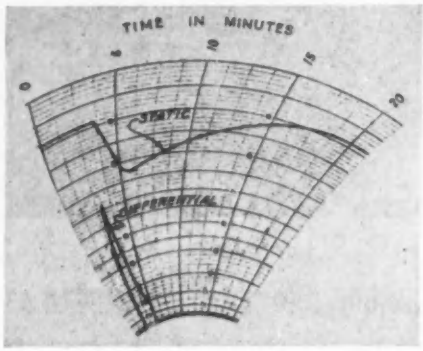

Fig. 2—Segment of two-hour chart from same gas lift meter installation as in Figure 1.

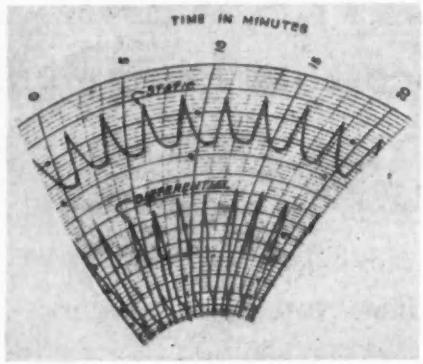

Fig. 3—Segment of chart from two-hour intermittent clock meter. Same installation as in Figures 1 and 2.

availability of gas supply, producing characteristics of the well, etc.

However, the existence of some of these variations will be apparent from an inspection of the seven-day chart, and suitable allowances can be made in many cases. A typical kick for the same meter installation illustrated in Figure 1, recorded on a two-hour chart, is shown in Figure 2.

Intermittent Clock Operation. In order to gain the advantages of fast clock speeds without increasing the frequency of chart changing, a meter has been developed in which the clock is allowed to run only during such

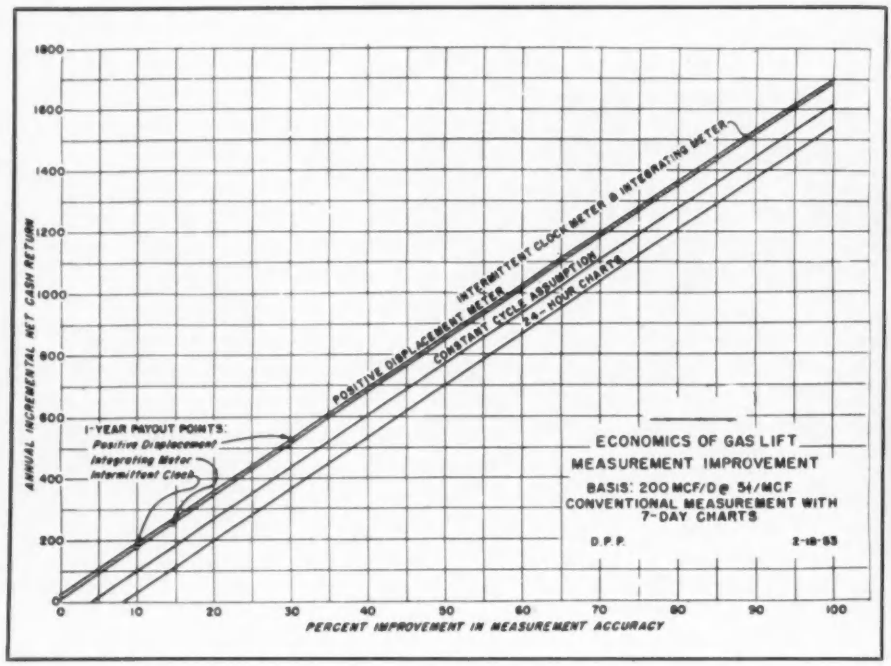

Fig. 4—Economics of gas lift measurement improvement.

times as gas is actually flowing, as indicated by the differential on the meter. The intermittent clock is started by movement of the differential pen away from zero, or from some set position, and the clock stops when the pen drops back to its original position. The instrument would normally be set for the clock to run whenever any differential whatsoever is indicated, unless a measurement of an intermittent flow superimposed on a steady flow is being attempted.

The clock speed to be used would be selected on the basis of the normal intermitter setting on a given installation. For the installation illustrated in Figures 1 and 2, gas is passing 2½ minutes out of every hour, which would be 60 minutes a day, or seven hours per week. Therefore, if charts were to be changed once a week, an eight-hour clock would be used. If charts were to be changed daily, a one-hour clock might be used, although a two-hour clock would probably be better, in case there were any variations in the individual cycles. Figure 3 shows a segment of a chart from an intermittent clock meter with a two-hour clock speed on the same installation illustrated in Figures 1 and 2.

Integrating Meters. Integrating meters are now available in which the differential reading is sensed and totaled on a counter as frequently as 24 times a minute (every 2½ seconds). This represents quite an improvement over earlier models, which integrated at less frequent intervals, and probably will give very good results in cases where the static pressure does not vary appreciably. The intergrator-totalizer attachment is not capable of sensing changes in more than one variable (the differential reading), so it is necessary to assume a constant or average static pressure in using these meters. There are many cases where this can be done without the introduction of serious error.

A source of electric current supply is required for the use of these meters since the totalizing mechanism is usually driven by a low-speed synchronous motor. This mechanism is available as an explosion-proof unit for mounting inside the mercury manometer case. Attempts have been made to develop a gas-driven motor for use in this service, but at the present no such unit is known to be available. Totalizers may also be used with the variable-area type of flowmeter, although this type of meter is not commonly used in field gas measurement.

An instrument could be set up which would allow for static pressure variations, but it would probably prove to be more expensive than would be justified by this type of measurement. Such an instrument would involve two sensing mechanisms sending out electrical signals, which would be received by an elec-

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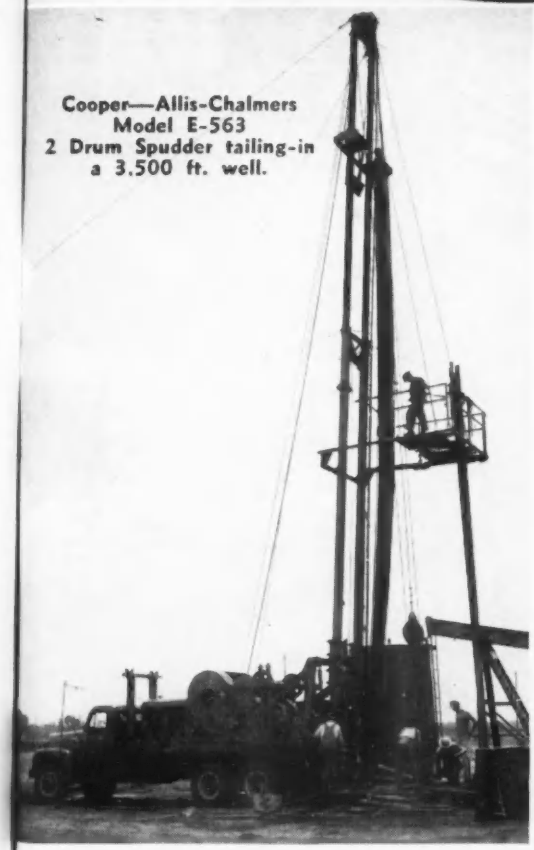

Cooper—Allis-Chalmers
Model E-563
2 Drum Spudder tailing-in
a 3,500 ft. well.

Cooper—Allis-Chalmers Model E-563 Rod and Tubing Servicing Winch Units and Double Pitman two or three drum tailing-in Spudder Units.

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or

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Whichever you choose, you get all of these outstanding features in the Cooper—Allis-Chalmers Model E-563

1. Chains run in line at all times.
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   36″ Dia x 6″ wide brakes for depths to 5000′.
4. Patented Air Cooled Brakes with demountable rims.
5. Allis-Chalmers Engine built especially for stationary work with Wet Cylinder Liners—valves in head—forced feed lubrication—ample cooling capacity.
6. Quick Drop Two Pitman Spudder with tool travel of 22″, 28″ or 36″—proper tool action for the fastest possible drilling.
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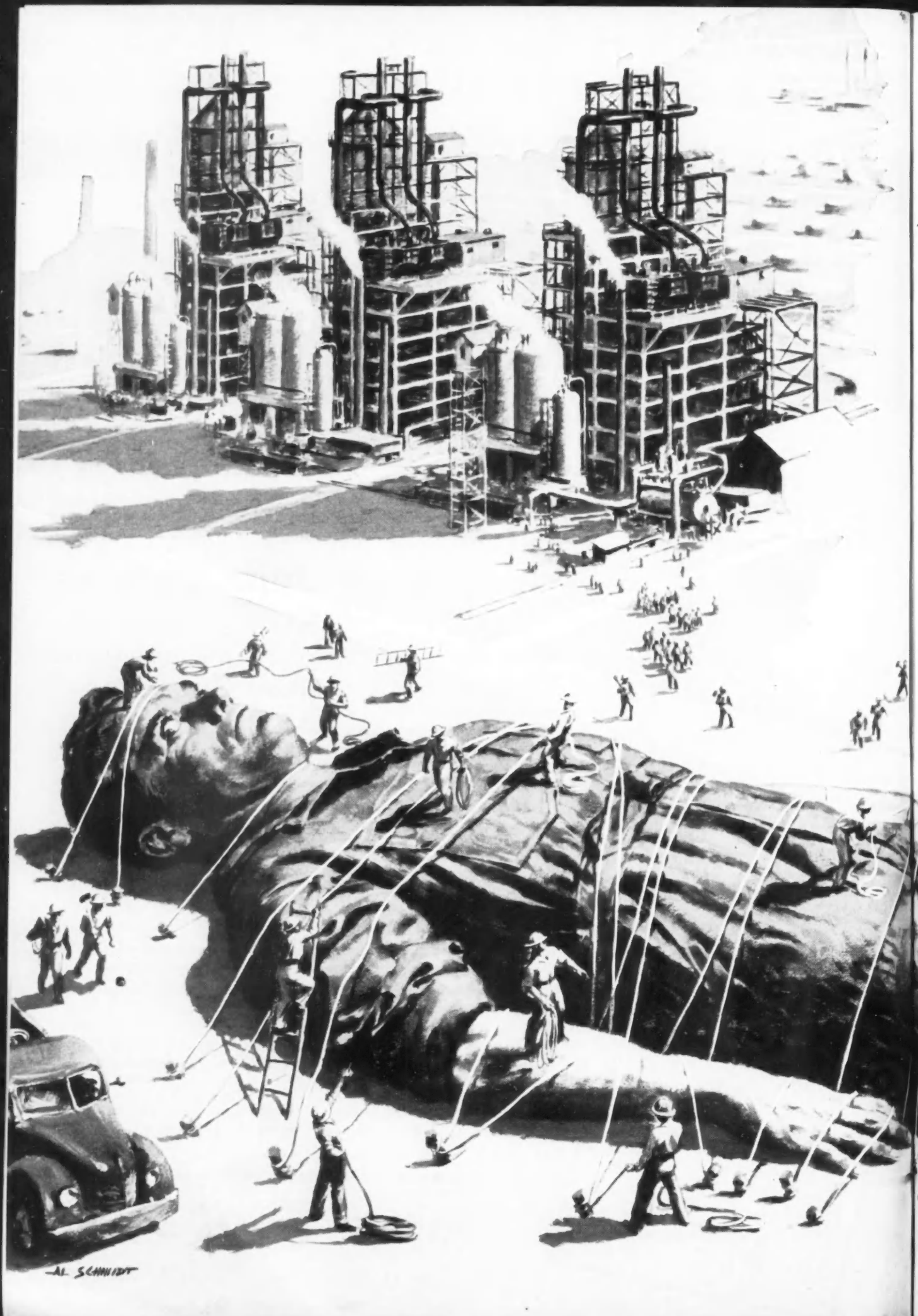
AL SCHMIDT

How Would You Go About Taming a Giant?

FOR MILLIONS OF YEARS the Giant slept.

In 1863, Man disturbed his mighty slumber, tamed him and put him to work for the good of all.

The Giant was called Petroleum.

How did enterprising men go about harnessing this stupendous new source of energy?

Here is how they did *not* go about it:

They did *not* turn the problem over to a government agency.

They did *not* say, "Whale oil is good enough. Why bother with this newfangled stuff?"

They did *not* say, "Too many problems involved. Too many risks. We might lose our shirts."

They *did* get to work and promote risk capital for drilling.

They *did* make this new source of energy available to all the people.

They *did* seek—and find—new ways to put the Giant's talents to work making hundreds of new products, creating thousands of new jobs.

Among these energetic giant-tamers were men of Cities Service. They had begun as processors of whale oil. They were quick to see the possibilities of "rock oil." They were among the first to study the sciences of combustion and petro-chemistry.

The petroleum Giant is now a docile servant of mankind. It has made our lives easier in countless ways. But Cities Service researchers say it has muscles it hasn't even used yet!

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tronic device capable of converting them to a direct flow total.

Positive Displacement Meters. Use of the high-pressure positive displacement type meter has, in general, been limited to the measurement of liquids. Meters operating on the rotary-positive displacement principle have given good performance in the field of high pressure liquid measurement. Most domestic and industrial gas meters are positive displacement meters, but these instruments are usually limited to less than 200 pounds per square inch working pressure. This same type of meter could be used for measurement of gas under pressure, and offers a different type of approach to the gas lift measurement problem.

Use of these meters would require an assumption of an average static pressure, but this would be permissible in many cases. High-pressure liquid meters are commercially available (2 to 6-inch sizes, 1000-pound working pressure) with capacities from 120 to 650 gallons per minute. In gas capacities, these volumes would be 1.6 to 8.6 million cubic feet per day at 1000 pounds per square inch absolute, or .8 to 4.3 million cubic feet per day at 500 psia. Very few gas lift installations require instantaneous gas flow rates above these volumes.

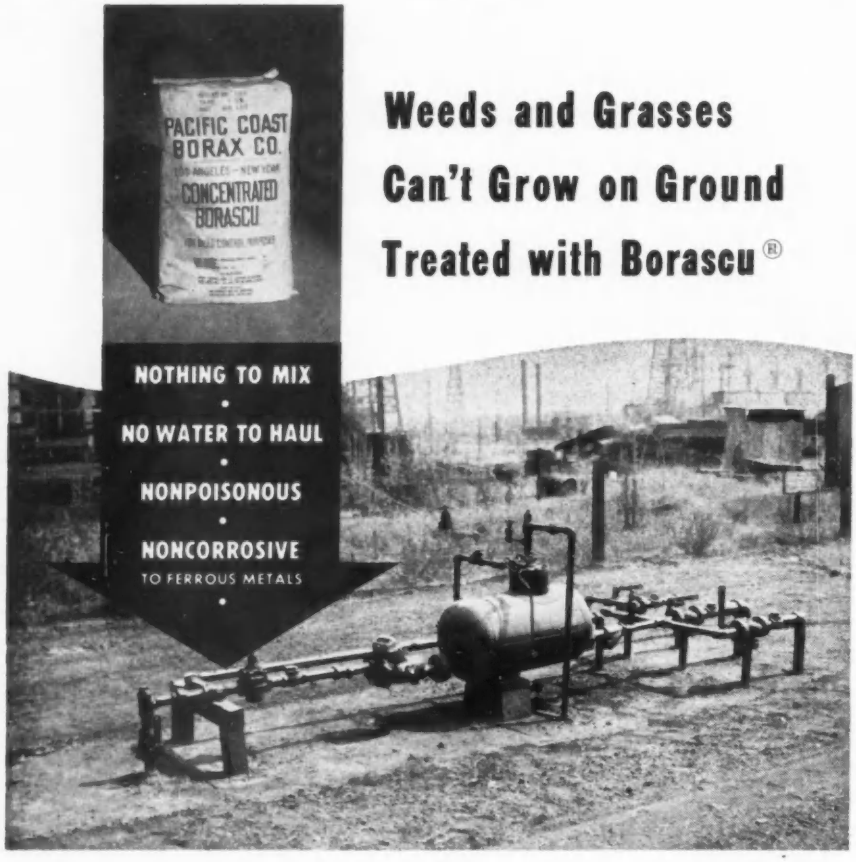
Reasonably accurate results should be expected from this type meter, except at very low rates of flow (less than 10 percent meter capacity). The meters must be kept free of abrasive matter and hydrates, but this can be accomplished with a filter. It may be necessary to install a stricture downstream of the meter to prevent damage due to the sudden surges of flow.

Dual Meter Settings. Sometimes it will be advantageous to combine several measurement methods on one installation, particularly in cases where an intermittent flow is superimposed upon a steady flow. This may be done with two recorders in parallel off the same orifice taps, such as a standard recorder and an intermittent clock recorder. The intermittent recorder (fast clock) would be set to record only the intermittent kicks, while the standard recorder (normal clock speed) would record the steady flow and show only a vertical line for the intermittent kicks.

If the steady volume and peak volumes required different meter run or orifice plate sizes for good measurement, it might be possible to set two meter runs in parallel, with a motor valve arrangement controlled by the flow differentials to shift all or part of the gas volume from one run to the other. Such an arrangement would be expensive, but there may be cases where it could be justified.

Dual meter settings are quite often useful for test purposes, and may sometimes be useful in routine field measurement.

Economics of Better Measurement. When considering the accuracy of gas lift measurement, the problem of what to use as a standard of measurement will arise. This will probably have to be determined on the basis of individual judgment for a given installation. It is quite possible that any given gas lift measurement installation may be consistently in error, and this error



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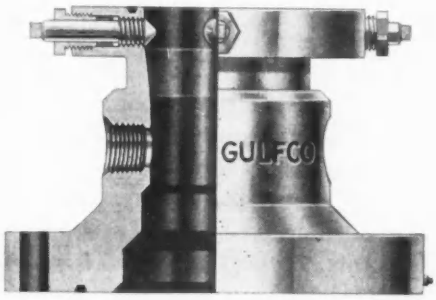
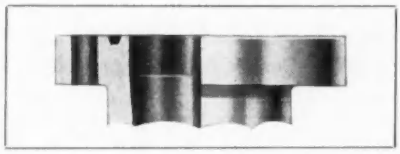


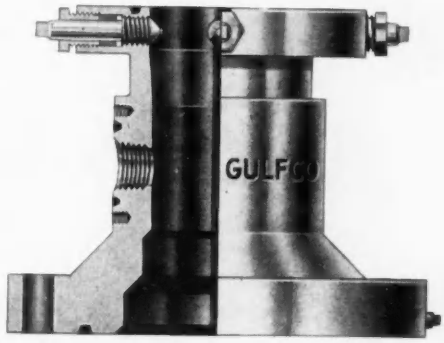
Type G-2F Threaded Side Outlets



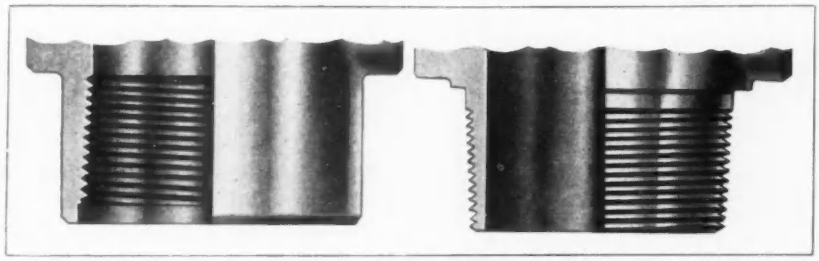
Type G-1 No Hold-Down Screws in Top Flange

These versatile full opening A.P.I. tubing head bodies are designed for maximum practical flexibility. All sizes have the same hanger seat design and all bottom flanges are bored for the Type O-2 seal and are provided with a test port.

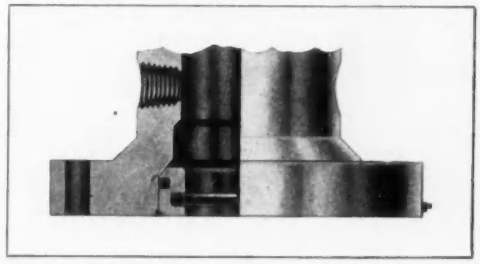
Below are shown hangers that are interchangeable in these bodies. Extra heavy hold-down screws are provided in the top flange of the Type G-2 and G-2F.



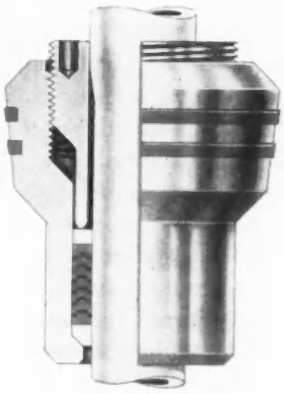
Type G-2F Padded Side Outlets



Type G-1 and G-2 Optional Female or Male Threaded Bottom Connection

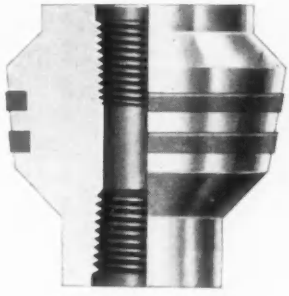


Type O-2 Seal in Lower Flange of G-1F or G-2F



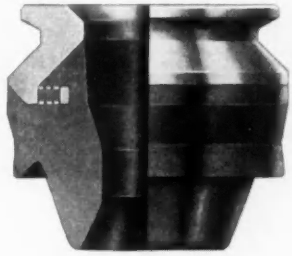
Type PR-2

This "polished joint" hanger is used when setting a packer—or in any dual zone operation which requires raising or lowering the tubing under pressure.



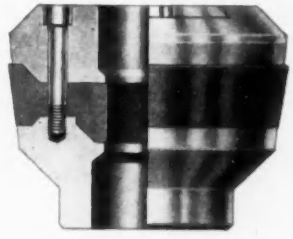
Type T-2

"Boll Weevil" or mandrel hanger with high pressure hydraulic packing seal . . . with or without hold-down screws.



Type S-6

This unique stripper is interchangeable in the G-1, G-2, and "FW" Tubing Head Bodies and can be used with all the various adapters.



Type LA-2

This split type hanger can be wrapped around any joint of tubing and latched. In an emergency it can be used as a blowout preventer by suspending on a collar and by tightening the hold-down screws.

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Slush Pump Liners
Low-Pressure Gas Burners
Low Water Alarms
Emergency Fuel Shut-Offs
Boiler Feed Water Regulators
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may be either favorable or unfavorable to the party making the measurement.

For the purpose of comparing various methods of measurement, however, it must be considered that any error is undesirable, regardless of its effect on the income of the party making the measurement. In the following discussion, an improvement in measurement accuracy is assumed to represent an increase in income.

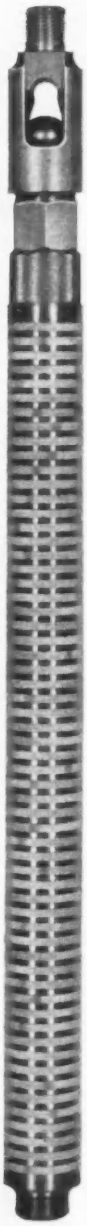
As an example of the type of comparison that can be made, a typical gas lift measurement installation has been assumed to be measuring 200 thousand cubic feet of gas daily, and the value of the gas has been set at 5 cents per thousand cubic feet, or $3,650 per year. This would be a reasonable value for lift gas if service is provided on the basis of a comparison and dehydration charge, and probably would be a conservative value if the gas is sold outright. The various methods for improving measurement discussed previously have been compared with conventional measurement with seven-day charts.

An analysis has been made of the relative investments and operating costs for each of the measurement methods, based on initial costs obtained from equipment suppliers, and operating costs from our actual experience with some of these methods. The annual increase in net cash return, after allowance for expenses and taxes, has been calculated for several percentage improvements in measurement accuracy, and the results put in graphical form for each of the methods. These results shown in Figure 4.

Two of the methods considered, use of 24-hour charts and assumption of a constant cycle, require no additional investment, but do require additional operating expense. The minimum percent improvement in measurement accuracy that would have to be obtained to pay the additional expenses can be seen for each method, and also the annual net cash return gained by improvements beyond this minimum. A 4½ percent improvement will pay for the expense of running a fast chart every week so that the constant cycle assumption can be used. An 8½ percent improvement is required to pay for the extra expense of 24-hour chart collection and integration.

For the other three methods considered, use of intermittent-clock meters, integrating meters, and positive displacement meters, additional investment would be required. For these methods, the net cash return curves have been plotted, and the percent improvement necessary to give a one-year payout on the additional investment has been indicated on each curve. The percent improvement necessary to give any other payout may be easily calculated. To pay out in one year, an intermittent-clock meter would have to improve measurement by 10 percent, an integrating meter by 14½ percent, and a positive displacement meter by 30 percent.

All of these data are based on incremental improvement in accuracy over that attainable with conventional seven-day charts. The inherent limitations of each of the methods, which have been discussed previously, must be considered in estimating the im-



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provement in measurement that can be attained by each method.

Accuracy of Gas Lift Measurement. There is no reliable standard of accuracy for gas lift measurement. It is certainly not reasonable to assume that conventional measurement, with seven-day or even with 24-hour charts, will give an accuracy equivalent to that expected from a normal orifice meter installation. The accuracy that can be attained will depend to a large extent on the interpretation of the chart record by the individual who integrates it. In addition, all orifice meter measurement of produced gas from gas lift wells will be subject to error due to variations in gas gravity during each cycle of gas injection. This error can be reduced by using a weighted average gravity for each installation.

Any method utilizing a fast chart speed will give better measurement, at least for the period of time that the fast clock is in service. If the constant cycle assumption is used, an inspection of the seven-day chart record will usually show whether there were any abnormal cycles which would make such an assumption invalid. The chart record of an intermittent-clock meter will show a single-line arc for any kicks where the meter mechanism failed to start the clock. For the meters requiring assumption of a constant static pressure, the error introduced can be easily calculated by measurements of the static pressure variation.

The curves of Figure 4 have been extended up to the high figure of 100 percent improvement in measurement accuracy. This range is not unreasonable, since errors of such magnitude are not uncommon in gas lift measurement.

The intermittent-clock meter and the assumption of a constant cycle based on Figure 2 gave very close checks, and indicated a gas volume of 357 thousand cubic feet for the week covered by the chart of Figure 1. This chart was being used for routine measurement on the meter installation, and was integrated at the end of the month in the routine manner, along with all other charts from this field.

Several weeks later, the chart of Figure 1 was checked to determine what gas volume was obtained by routine integration, without benefit of the special charts (Figures 2 and 3). The integrated volume was 910 thousand cubic feet for the week. There were no abnormal kicks shown on the chart, and the constant cycle assumption appeared to be valid. If the constant cycle and intermittent-clock methods are assumed to be correct, the integrated volume for this particular week was in error by 155 percent.

Conclusions. The field of gas lift measurement is one in which much improvement is possible. Several methods are available for improving the accuracy of measurement, and it appears that there is sufficient economic justification for the additional expense or investment required by these methods. Insufficient test work has been done to establish the accuracy of these methods, but no suitable standard of accuracy is available. Available information does indicate that these methods give better measurement than conventional field practices.

—The End

ACKNOWLEDGMENT

This paper was presented by the author at the Southwestern Gas Measurement Short Course held at Norman, Okla., April 22, 1953.

About the Author

DUDLEY P. PENICK is a process engineer in the Natural Gas Department of the Magnolia Petroleum Company at Dallas. He received his B.S. and M.S. degrees in chemical engineering from the University of Texas, and joined Magnolia in May, 1949, as plant engineer at the Sabine gasoline plant, Kilgore, Texas. In 1950, he was transferred to the company's Dallas office, and has been engaged in process engineering and design work since that time.

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How to do it

PRODUCTION HINTS

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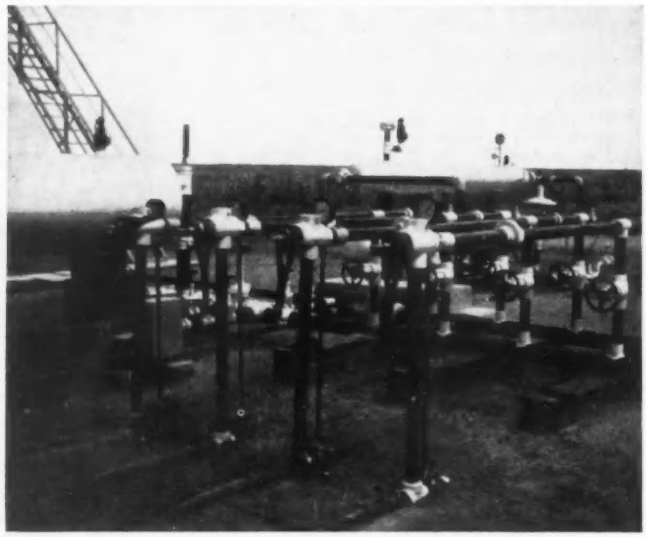
Controlling Production at Battery

Many hours of driving and inspection by the company pumper can be saved when good flowing wells are involved. Among his duties are changing chokes, regulating flowing pressures, opening or closing wells. By locating flow line chokes, as well as gauges, at the tank battery, much of the pumper's work at the well can be eliminated. By simply checking flow line pressures, he is able to tell much about what the well is doing.



Pictured is a four-well battery equipped with chokes and pressure gauges on each flow line as it comes into the header. Chokes are installed at convenient height where the flow lines make a 90-degree bend for a horizontal run to the test and battery separators. A reducer screwed into the open end of a tee at the bottom of this riser accepts a three-fourths-inch line that supports a pressure gauge at the same level with the adjustable choke. This smaller line contains a needle valve that closes the line should the gauge need be removed. With all four lines properly labeled as to well name and number, the pumper's job is greatly simplified by this arrangement, in addition to giving some operational advantages. Full well pressure up to the tank battery means that oil temperature in the flow line is near that of the formation oil. Paraffin is kept in solution longer. Beyond the choke, oil is much cooler due to the refrigeration effect of choking to lower pressures.

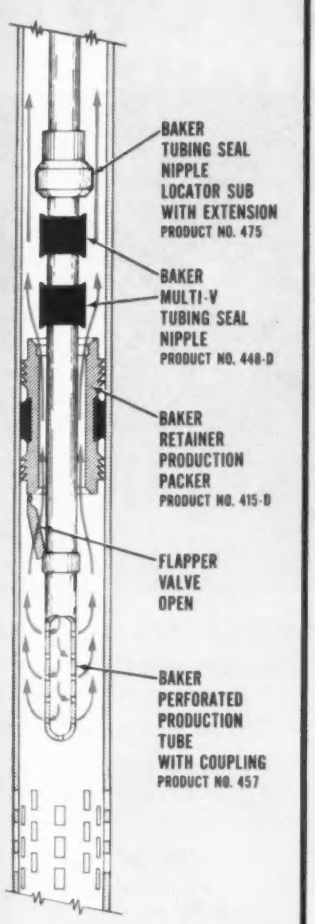
Moving Pumping Unit Base

Simplify pumping unit foundation problems by fabricating a portable base that is easily transported from one location to another. On such light-weight units as the one illustrated, it is practical to fabricate in the welding shop a light-weight pumping unit base that is 100 percent salvageable and is easily moved.

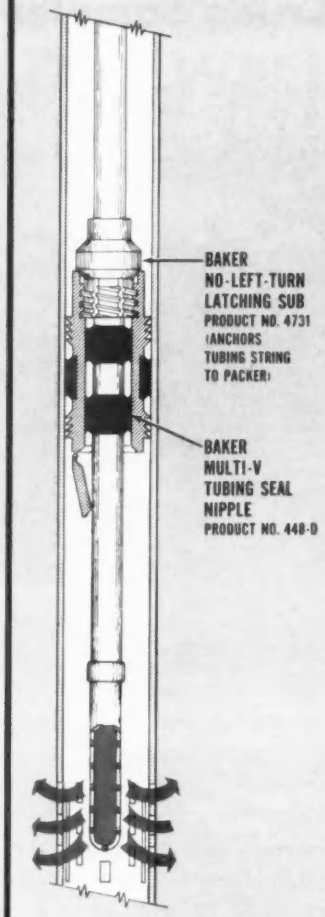
Made from discarded six-inch pipe, the foundation is a box framework that extends the full length of the combined pumping unit skid, and is about two feet high. An extended cross member is incorporated at the front end of the skid to provide additional footing where the load will be greatest during pumping operations. The engine is mounted on a small foundation in the rear of the unit, and placed at ground level. This type construction requires little preparation of the well site prior to installing the pumping unit, and when the unit is moved from the location, very little cleanup work is needed.

Guarding Well Head

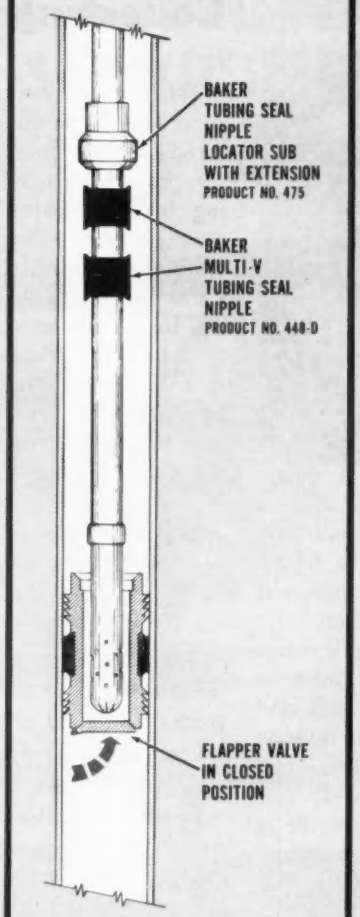
Protect wells located on the side of mountains, steep hills, or at the bottom of steep valleys from falling rock and debris, or snow, by enclosing the christmas tree in a concrete "pill-box" structure. This flowing well high in the mountains of Utah was subjected to falling boulders as well as snow slides. Concrete walls measuring approximately 10 inches thick



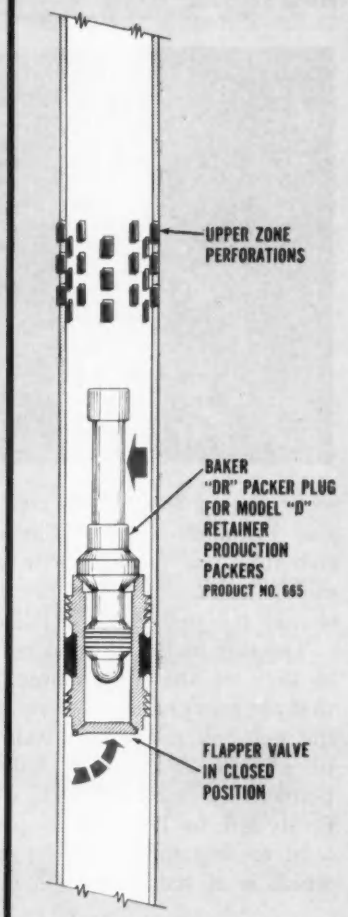
Washing or Circulating Tubing Seal Nipples removed from packer bore. Flapper Valve held open by tubing extending below Tubing Seal Nipples.



Pressuring Below Packer Acid or cement squeeze, formation fracture, gas or water injection. Latch Sub used when squeeze pressures exceed tubing weight.



Isolate Zone Below Packer Tubing String removed, Flapper Valve closed. Isolates pressure differentials (squeeze, productions) from below the packer.



Temporary Bridge Plug For working over zones above packer. DR Plug run in on Baker Retrievable Cementer, and retrieved with overshot. *Permanent Bridge Plug* can be formed with Trip Bob (not illustrated).

RESISTS CORROSION—The cast-iron used in the construction of Baker Packers is far more resistant to corrosion than the casing in which the packer is set, thus making it ideal for permanent installations, or for use in areas plagued with a severe corrosion problem.

EASILY DRILLABLE—The Baker Packer is constructed of drillable cast-iron, and its design supplements the breaking-up action of the bit. Whether it has been in the well for only a few hours, or for ten years, the Baker Packer can be drilled up in minimum time. Expensive and hazardous "milling-out" operations never are required.

IMPORTANT FACTS

Baker Packers are used in a majority of installations where conditions of extreme pressure, temperature, or depth are present. Baker Packers also dominate Dual Zone installations, particularly those involving two-packer, crossed-flow arrangements.

BUT IT IS ALSO TRUE that *more* Baker Packers are used for *simple single zone* completions than for *any other type of completion*, and that *most* Baker Dual Zone installations employ *only one* packer.

Ask any Baker representative, or office, for complete details, as well as your copy of the recent Baker Equipment News dealing with DUAL ZONE COMPLETION PRACTICES. There is no charge, and no obligation, for specific recommendations and completion planning advice available from Baker Technical Advisers. Why not be prepared for your next completion?

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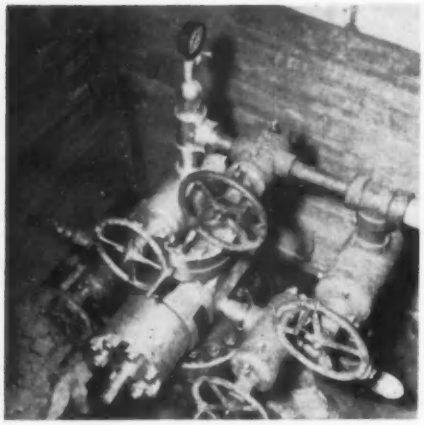
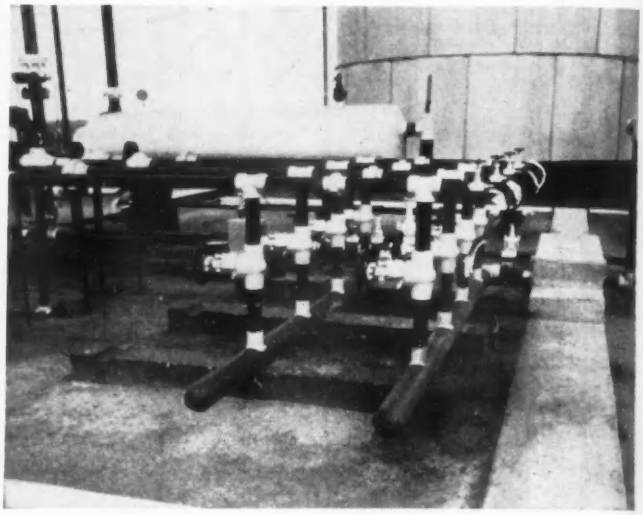
RETAINER PRODUCTION PACKER



were poured around the tree after it was installed. Top of the pill box structure was covered with a heavy metal lid that could be removed should the well be serviced, etc.

The side facing down slope was not as high as the other three sides so that the pumper could easily look into the pill box and check well flowing pressures, manipulate valves, etc. Foundation of the concrete walls was firmly set in bedrock to provide a solid footing for the entire structure which is of monolithic concrete.

Collecting Crude Samples



Where high pressures are encountered on flow lines, the problem of taking fluid samples may be solved by using a needle valve on the sample tube connected to the individual flow line. In the case illustrated, oil and gas come into the tank battery at full well pressure, and this pressure is controlled by individual chokes on each flow line. However, the downstream pressure is relatively high. The flow line comes into the header from a vertical section that is connected to two horizontal headers near the ground level. One header is for the test separator, while the other header serves remaining wells through the regular lease separator.

A swedge is screwed to the tee that directs the line downward to the test separator header. A needle valve is attached to this swedge so that samples taken during the time the well is on test can be carefully controlled. The needle valve serves as a choke to further reduce the line pressure so that control is maintained. Discharge

Air-powered

TUBING SPIDER

(A Cavins Co. Product)

(Pat. Pend.)

Two of the many reasons why you will be glad to own an

Advance

TUBING SPIDER

1 **SAFETY:** The Spider is equipped with a manually operated safety latch which may be used to positively lock the slips in their closed position.

2 **ALLOWS STRIPPING:** Slip design and low working pressure allow operator to strip tubing and collars up through the slips while they are in closed position. Also, the slips cannot be accidentally thrown away from the tubing if the tubing should part or slide.

Bulletin TS-54 tells the whole story.
We invite you to send for your copy.

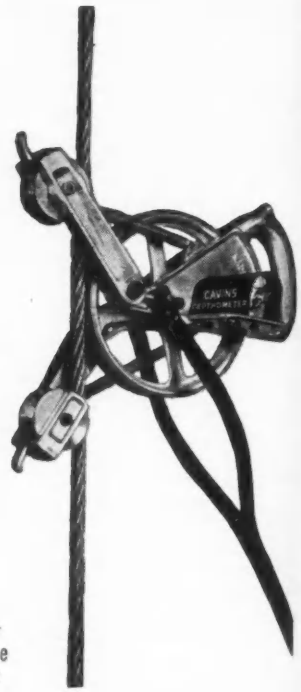
Advance Oil Tool Co.

2853 Cherry Ave., Long Beach 6, Calif., Ph. 485-64

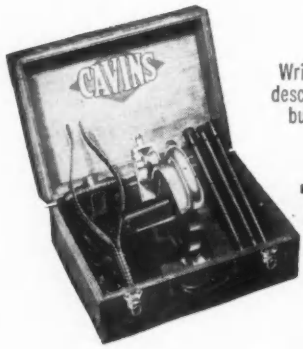
Mid-Continent Rep: Hillman-Kelley
Export Rep: Roland E. Smith

CAVINS

DEPTHOMETER



The ideal instrument for taking depth measurements with sand lines while bailing, swabbing, or running a single shot survey. Does away with "stringing-in."



Write for descriptive bulletin

The CAVINS Co.

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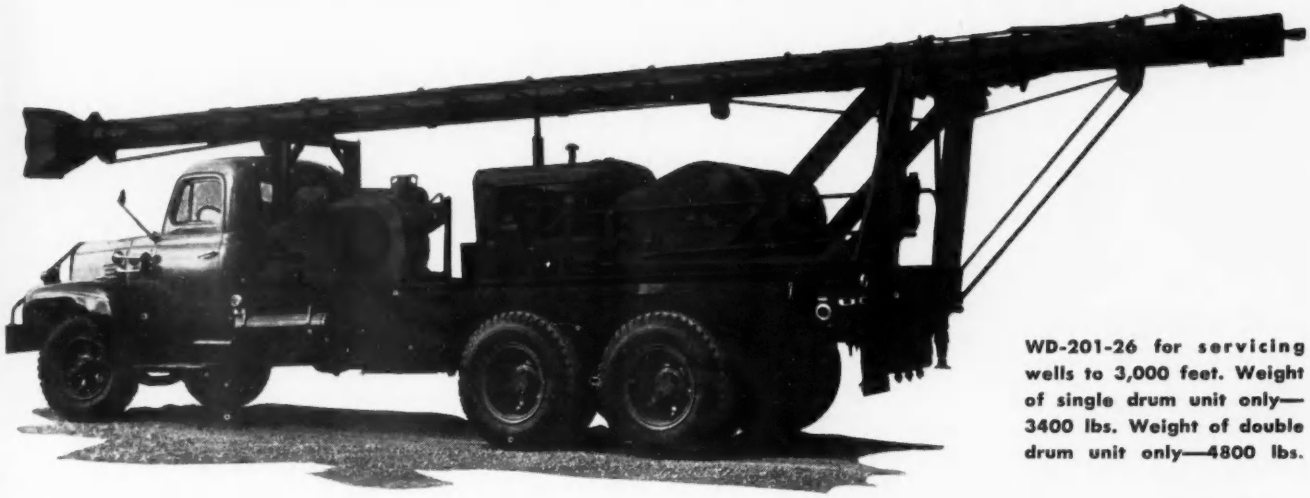


WD-201-26 for servicing wells to 3,000 feet. Weight of single drum unit only—3400 lbs. Weight of double drum unit only—4800 lbs.

B-125-20 for servicing wells to 2,000 feet. Weight—2,160 lbs.

Hundreds of these winches are being used every day by contractors and producers who vouch for their unmatched economy.

DEPENDABLE—Like all Cooper—Allis-Chalmers equipment these small units have the rugged construction to "stay in there" for years. The Allis-Chalmers engines are modern in design with valves in head, removable cylinder sleeves, forced feed lubrication and ample cooling capacity to assure proper cooling under the most severe operating conditions. Transmissions are Allis-Chalmers heavy duty tractor type built especially to take the full power of the Allis-Chalmers engines.

Winch drums are all steel mounted on pre-lubricated and sealed ball bearings that require no further lubrication.

COMPACT—Balanced construction—proper weight distribution for mounting on 1 ton to 1½ ton trucks, with low center of gravity even when equipped with telescoping masts.

Before you buy—see the Cooper—Allis-Chalmers line of modern well servicing equipment. Lower in first cost, lower maintenance cost—better performance.

FRED E. Cooper, Inc.

P. O. BOX 1890 TULSA, OKLA.

Houston, Odessa, Los Angeles

IN WELL AFTER WELL...THE JOB: PUMP MORE FLUID

These are actual cases where "Double-Displacement" pumps replaced conventional pumps

EAST TEXAS — MAJOR'S #2

Well Data	2¼" TL Pump	2½"x2" Bore "D-D" Pump
Pump Depth	2800'	2800'
Stroke	74"	74"
S. P. M.	20	20
Other Factors	Same	Same
Total Bbl. Fluid	880	1026
Bbl. Water	872	1012
Bbl. Oil	8	14

Total increase: Fluid 16.6%. Oil: 75.0%.

KANSAS — INDEPENDENT'S #2

Well Data	2" Rod Pump	2"x1½" Bore "D-D" Pump
Pump Depth	3420'	1984'
Stroke	54"	54"
S. P. M.	21	17
Other Factors	Same	Same
Total Bbl. Fluid	480	720
Bbl. Water	474	690
Bbl. Oil	6	25

Total increase—Fluid: 50%. Oil: 316%.

GULF COAST — INDEPENDENT'S #3

Well Data	2¼" Bore Common Working Barrel Tubing Pump	2½"x2" Bore "D-D" Pump
Pump Depth	1525'	1525'
Stroke	120"	120"
S. P. M.	12	12
Other Factors	Same	Same
Total Bbl. Fluid	568	883
Bbl. Water	557	860
Bbl. Oil	11	23

Total increase—Fluid: 55.4%. Oil: 109.0%.

ARKANSAS — MAJOR'S #2

Well Data	1¾" Bore Tubing Pump	2"x1½" Bore "D-D" Pump
Pump Depth	3500'	3500'
Stroke	54"	54"
S. P. M.	20	20
Other Factors	Same	Same
Total Bbl. Fluid	237	314
Bbl. Water	221	293
Bbl. Oil	16	21

Total increase—Fluid: 32.4%. Oil: 31.0%.

OKLAHOMA WATER FLOOD INDEPENDENT'S #2

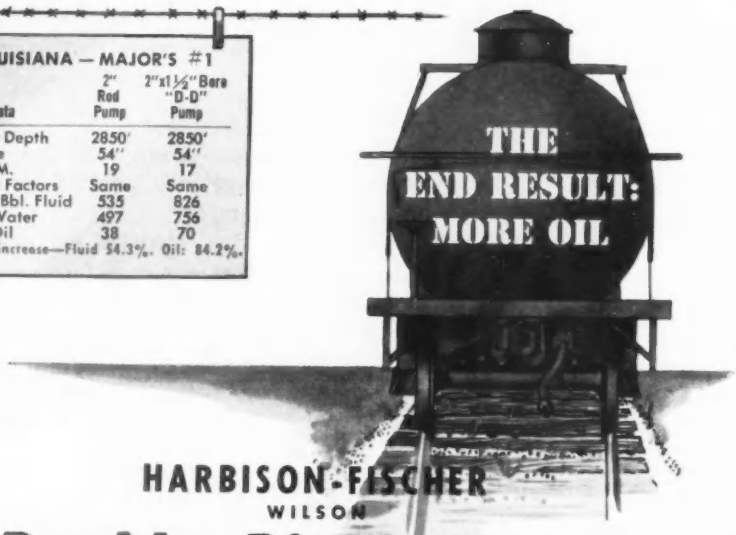
Well Data	2¼" Bore Tubing Pump	2½"x2" Bore "D-D" Pump
Pump Depth	1700'	1700'
Stroke	42"	42"
S. P. M.	26	26
Other Factors	Same	Same
Total Bbl. Fluid	665	1010
Bbl. Water	510	800
Bbl. Oil	155	210

Total increase: Fluid: 51.8%. Oil: 35.0%.

LOUISIANA — MAJOR'S #1

Well Data	2" Rod Pump	2"x1½" Bore "D-D" Pump
Pump Depth	2850'	2850'
Stroke	54"	54"
S. P. M.	19	17
Other Factors	Same	Same
Total Bbl. Fluid	535	826
Bbl. Water	497	756
Bbl. Oil	38	70

Total increase—Fluid 54.3%. Oil: 84.2%.



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WILSON
Double-Displacement
PAT. PEND.
ROD PUMP

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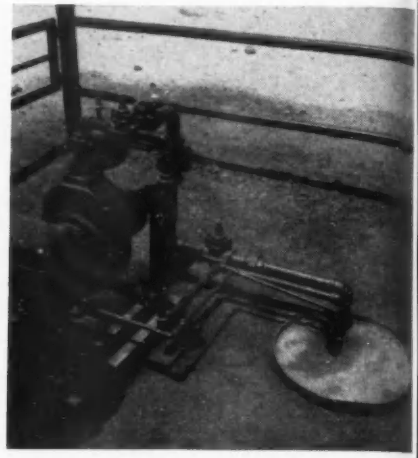
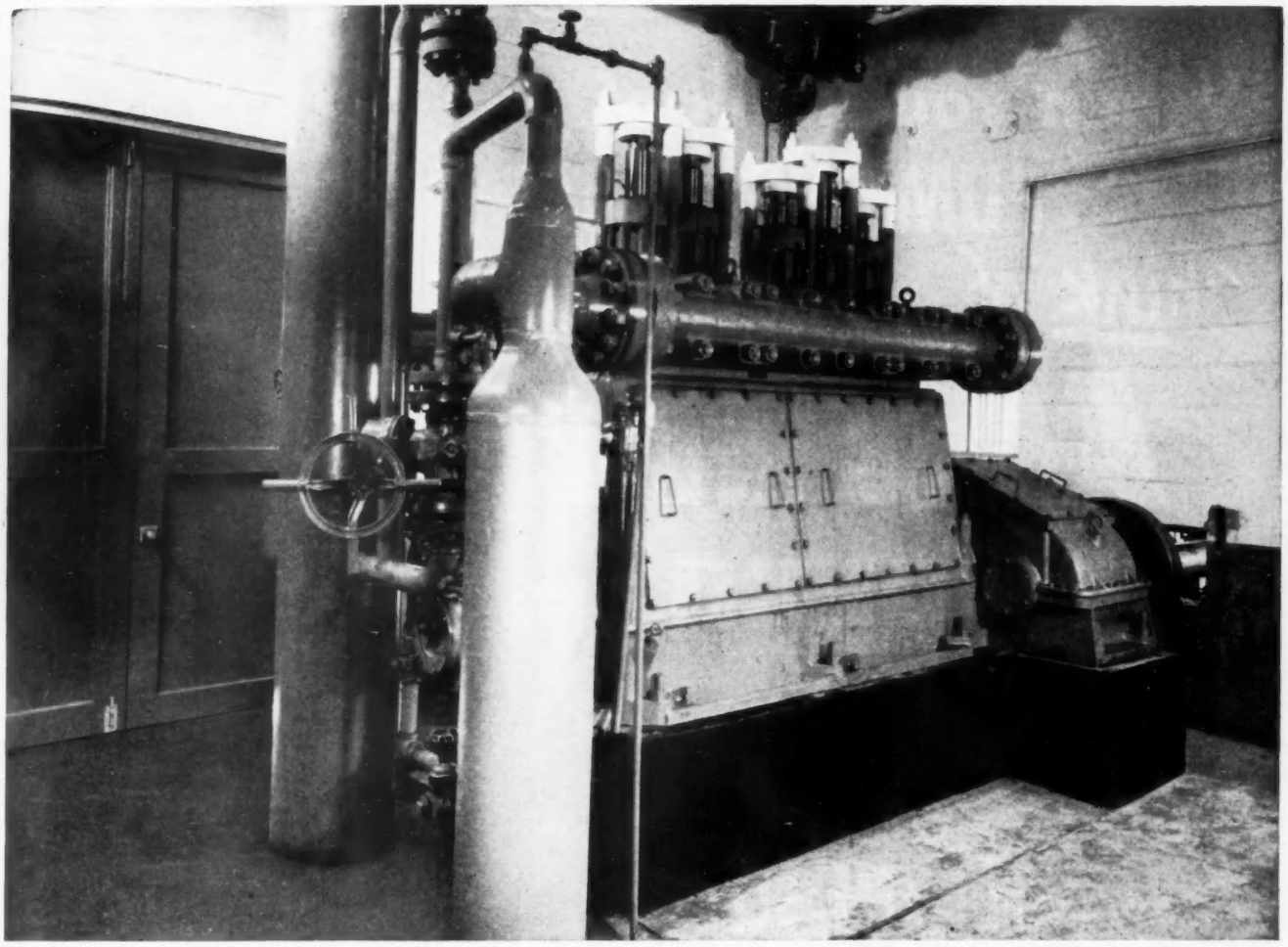
from the needle valve is through a curved section of copper tubing directed downward to fill the collecting vessel.



Aiding Pump Efficiency

Increase the efficiency and flexibility of a centrifugal gathering pump by incorporating a buried steel storage drum adjacent to the pump. The oil storage drum has several uses. It is buried for convenience and to provide a neat installation. Oil leaking from the pump shaft packing gland is collected and drained into this oil sump. A two-inch line connected to the pump suction extends into the barrel and is equipped with a plug valve. A second line, of 1½-inch pipe, extends from the pump discharge through a plug valve into the buried barrel.

Use of these two larger lines includes catching oil when bleeding the suction line of air. Since oil in the stock tanks at the battery exerts a head of presure on the suction, little difficulty is experienced in priming the pump. Any air in the line extending from the pump suction to the stock tanks must be removed before starting the pumping operation, since air in the oil line can cause damage down the line to reciprocating pumps. To release entrained air, the two-inch valve on the discharge line extending into the barrel is opened until a full flow of oil is noted. At this point, the pump is started and discharged momentarily back into the buried barrel to make sure all air is out of the pump. With all trapped air removed the 1½-inch valve on the discharge line into the barrel is closed and oil



ALDRICH PUMPS Send Liquids Through Cross-Country Pipe Line

In service at the North Salt Lake Pumping Station of the Salt Lake Pipe Line Company, this Aldrich Quintuplex Inverted Direct Flow Pump and a twin unit are used to pump liquid products through an 8″ pipe line to Boise, Idaho, some 350 miles distant.

Fluids sent on their long distance journey by these Aldrich Pumps include regular and premium automotive gasolines, Diesel fuels, stove oils and alkyate. Pumps feed 375 gpm, against maximum discharge pressure of 1700 psi. Suction pressure averages 30 to 40 psi. Installed in December 1952, these pumps already have been in operation more than 2000 hours each.

This operating performance story is typical of Aldrich's record throughout the oil industry. In whatever way they're called upon to serve—whether water flooding, lean oil service, salt water disposal, crude and gathering lines, product lines, bottom hole pump service, or pumping liquid hydrocarbons—Aldrich Pumps set standards for dependable operation.

With Aldrich Pumps the user gets several marked construction advantages and benefits. For example, fluid ends are sectionalized, so that parts can be replaced quickly and at low cost. Plunger sizes are changeable, and wearing parts are interchangeable among pumps of the same stroke sizes. And ample stocks of spare parts are maintained at Mid-Continent and California locations.

Aldrich Direct Flow units are available in 3″, 5″ and 6″ stroke sizes, with 3, 5, 7, or 9 plungers . . . range from 10 to 2400 hp. Pressures are available to meet requirements (up to 15,000 psi or higher).

Write for catalogs, engineering service or a representative's call. We invite your inquiries.

THE ALDRICH PUMP COMPANY

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. . . Originators of the Direct Flow Pump

Representatives: Bushnell Controls & Equipment Co., 3929 W. Jefferson Blvd., Los Angeles 16, Calif. • Cross Pump & Equipment Co., P. O. Box 889, Charleston 23, W. Va. • L. T. Gibbs, 509 Petroleum Bldg., Tulsa 3, Okla. • R. B. Moore Supply Co., Inc., Bolivar, N.Y. • Walter Norris Engineering Co., 20 N. Wacker Dr., Chicago 6, Ill. • Power Specialty Co., 2000 Kipling St., Houston 6, Texas • Reeves & Skinner Machinery Co., 2211 Olive St., St. Louis 3, Mo. Stearns-Roger Manufacturing Co., 1720 California St., Denver 2, Colo. • Export Sales: Petroleum Machinery Corp., 30 Rockefeller Plaza, New York 20, N.Y. • Birmingham • Buffalo • Cincinnati • Cleveland • Dallas • Detroit Duluth • Jacksonville • New York • Oakland, Calif. • Omaha • Philadelphia • Pittsburgh • Portland • Richmond • Rochester • Salt Lake City • San Francisco • Seattle • Somerville, Mass. • Spokane • Syracuse • Youngstown

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is pumped into the field gathering line. If the barrel should be full, it may be pumped down at the end of the pumping operation when oil is removed from the stock tanks. The buried barrel makes it possible to circulate oil through the pump if desired.

Heating Gas

Eliminate hydrate freezing by heating gas in a small direct heater made from salvaged casing. Where volumes of gas to be handled are insufficient for commercial heaters, a shop-made unit to increase the gas temperature above the hydrate point can be made from discarded casing.

This small heater is made from 16-inch casing through which a piece of six-inch pipe is extended. The gas passes through a heating chamber formed by the annulus inside the larger casing. The annulus is sealed off about one foot up inside the 16-inch casing, and around the top. Gas enters this chamber through a two-inch connection at the bottom right and flows out of the heater through the two-inch line near the top of this chamber. The section below the bottom of the heating chamber forms a burner box in which field gas is burned. Heat travels up the inner six-inch pipe and exhausts out the extended stack which creates a draft. A hinged door on the burner box is provided for access to the pilot flame and burner.

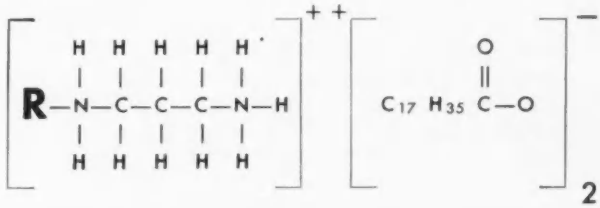
Temperature of the gas is governed by a temperature controller in the discharge line. When temperatures exceed predetermined values, the con-

New Armour chemical cuts corrosion costs of primary wells

Major petroleum companies find Duomeen® T Dioleate more effective than dilute inhibitors — and lower in cost!

The latest development of the Armour Chemical Division's petroleum chemists is Duomeen T Dioleate—a potent corrosion inhibitor for "Down the Hole" treatment of primary producing wells. The ability of this new cationic surface active agent to convert steel surfaces from water-wettable to oil-wettable, thus forming a protective film, is the reason for the excellent protection provided by Duomeen T Dioleate.

Manufactured under exacting laboratory specifications, Duomeen T Dioleate is supplied *100% active*—water insoluble but readily soluble in common solvents. Particularly outstanding results have been obtained in controlling acid conditions in sour wells. Laboratory and field tests report 20 ppm of this chemical sufficient to gain maximum effectiveness. While this amount is reported as being successful, it is realized that specific locations and conditions may exist where greater concentrations are necessary. However, since Duomeen T Dioleate is supplied 100% active, it provides great flexibility by permitting the user to meet such conditions by making up any desired solution at the site. Duomeen T Dioleate also has application in other hydrocarbon systems and product lines. For the benefit of engineers who wish to know the chemical structure of this new and unique product, the structural formula for Duomeen T Dioleate is as follows:



Samples and complete data are readily available. Simply fill in and mail the coupon with your letterhead for free samples and a copy of our "Combat Corrosion" bulletin and Technical Bulletin E-6, "Chemical Treatment in Oil Wells."

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MAY HAVE THE *RIGHT* ANSWER

. . . from 1/3 HP to 240 HP . . . from 20 bbls to 17,000 bbls . . . from 200' to 10,000' and more . . . Yes, a REDA may do that pumping job BETTER . . .

Reda Pumps are accepted as original equipment, or replacement equipment, because they produce at a lower cost per barrel of fluid. Whether it's large volumes from shallow depths, or modest volumes from great depths, Reda Pumps provide operating savings.

IMPROVED DESIGN:

Constant research and design improvement are responsible for lengthened operating life; corrosion resistance, low labor cost per barrel of fluid produced.

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Greatly improved overall efficiencies have improved Reda performance as much as 25%; a substantial operating saving.

If you have a pumping problem, our engineering staff is always ready to assist you. Phone or write:

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PUMP COMPANY

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BARTLESVILLE, OKLAHOMA

troller shuts off the supply of fuel gas to the burner. As the gas temperature drops below this value, the controller opens so that fuel gas is again supplied the burner. The pilot flame burns continuously and is supplied fuel through a one-quarter-inch copper tube which bypasses the controller. The complete unit is set on a concrete foundation and securely anchored by three bolts grouted in the concrete and attached to tabs welded to a collar screwed to the bottom of the 16-inch casing.

Guarding Pumps

An amber "trouble" light mounted on the outside wall of a water flood pump house lights up when trouble occurs. Color of the light is such that it may be seen for some distance in the daytime, at night, and even in fog or rain. Power for the light comes from the control panel of the pump house.

Since the project is automatic in nature, it is not necessary to maintain a full-time operator at the pump and filter plant on this water flood project. Pumps are electrically-driven and will shut down in case of overload, or in case lubricating pressure in the pumps drops below operating levels. Other abnormal operating characteristics will cause the plant to shut down. In any event, this amber light goes on as a warning that can be seen from afar. As soon as the difficulty is corrected, and all pumps are operating normally again, the light automatically goes off, to signify that all is well. Should the plant be shut down for repairs, enlarging the system, etc., the light can be disconnected manually.

Precision die-formed crowns interlocked with the inner liner under 40 tons pressure give more than just a "new look" to IGLOO Water Cans and Coolers. This new construction adds greater strength . . . assures better fitting lids that are easy to remove . . . provides more protection against rough handling . . . and makes IGLOO a better buy than ever. Still more news: IGLOO Water Coolers are now available in the convenient 2-gallon size. All coolers have flush-mounted spigots . . . positive protection against breaking off. Be sure you get the finest in water cans and coolers . . . be sure to say IGLOO. Your supply store has them.

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VL-5

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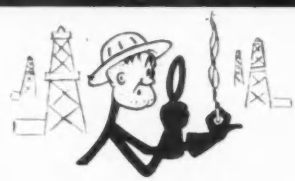

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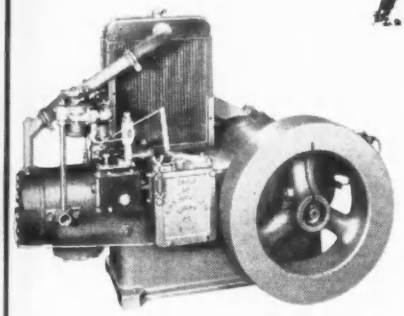
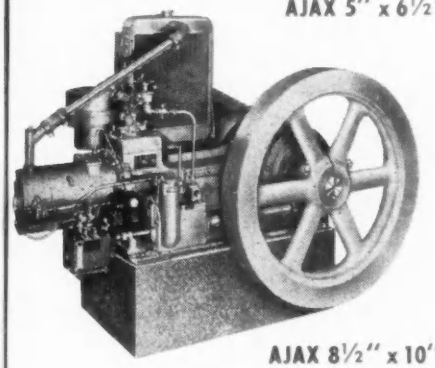
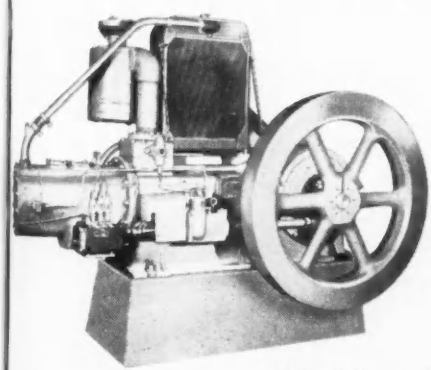


AJAX 5" x 6½" WL



AJAX 8½" x 10" CMA



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Chemical Feeders are used throughout the oil industry to keep wells and pipelines in good, flowing condition. *But,* in wet gas fields corrosion frequently stops the motors that power these feeders.

To solve this problem, Manzel developed a chemical feeder with built-in automatic force feed lubrication which protects the gas motor from corrosion and insures continuous operation of the feeder.

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- Reduce Wear
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Lubricating Polish Rod

Continuous lubrication of the polish rod of a pumping well can be accomplished by adding a collar and swedge nipple on top of the stuffing box to hold lubricating oil. During long shutdown periods, packing glands in the stuffing box become dry and shrink in size. When the well is placed on the pump again, it may be some time before oil reaches the surface, and undue wear on the polish rod results. When oil flows as a result of pumping, the packing gland will leak oil, and unless the pumper is at the well, an unsightly mess can accumulate around the location.

This simple and expedient means to overcome this situation includes only two items: a two-inch collar and a two by four-inch swedge nipple. The collar is connected to the top flange of the stuffing box so that the polish rod opening is centered in the collar. The swedge nipple is attached as shown. The cup is fllled with lubricating oil so that the polish rod operates continuously in oil. In this manner, the packing glands are always oiled, even though the pumping unit has been shut down. It is necessary, of course, for the pumper to add oil to the swedge periodically when he makes his rounds. This simple device has lengthened the life of packing glands, saved rod wear and prevented oil leaking around the well.

INCREASE b/d

WHEN PUMPING LOADS ARE HEAVY

THE AXELSON IMPROVED STANDARD MODEL HYDRAULIC LONG STROKE PUMPING UNIT IS PAYING OFF!

HERE'S WHY:

1. INCREASED STROKE LENGTH
Overcomes stroke loss due to rod and tubing stretch.

2. FEWER STROKE CYCLES PER MINUTE
Pumping equipment lasts longer with reduced cycle rates.

3. MORE PRODUCTION WITH GREATLY REDUCED ROD TROUBLE
Application of hydraulic power through centrifugal pump eliminates build up of excessive pressures at the polished rod.

4. LESS DOWN TIME
Unit is designed for simplicity of operation and is ruggedly constructed throughout.

An Axelson engineer is at your service for discussion of any specific pumping problem — no obligation, of course.

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PSC

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LS-15

HINTS . . .

Handling Heavy Gear

Load and unload relatively heavy equipment and tools on the gang truck by a manually operated winch boom. Such objects as big jacks, full oil drums, small engines, or many types of lease equipment normally are handled by the gang truck. Lifting and handling these items by hand could easily result in an injury. Add a small removable winch boom to the rear of the gang truck for this purpose.

The boom is merely a triangular framework of three-inch pipe equipped with sheaves on top and set in a nipple welded to the truck bed. Brace the nipple to stand the load carried by the winch, and enable the boom to be rotated through 360 degrees. Mount a wire line winch on the vertical member and fit with a large circular hand wheel which provides greater mechanical advantage to the operator when winching up heavy objects. When not in use, the steel hook attached to the end of the wire line is anchored to the truck and the winch line tightened to hold the device steady during transit.

For more than 33 years oil men everywhere have solved their production problems profitably and satisfactorily with . . .

JENSEN PUMPING UNITS

Complete information on how JENSENS can solve your production problems is yours for the asking. Or, if you prefer, see your nearest Jensen Dealer.

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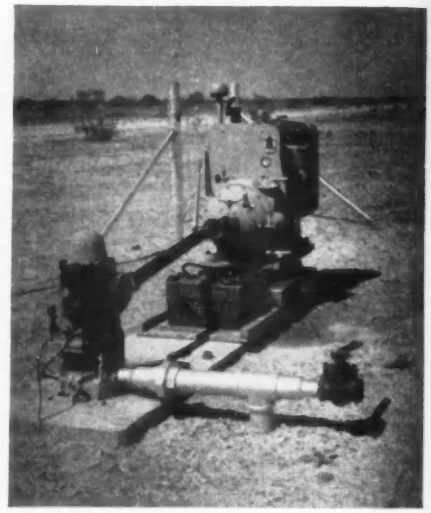


Driving Water Well Pump

Connect the gear box of water well pump to gas-fueled engine through ordinary truck drive shaft equipped with two universal joints. Power to drive this remotely-located fresh water well was supplied by a small internal combustion engine utilizing field gas for fuel. Since electric power was not available in this vicinity, the engine was used. The problem was to transmit the power to the multi-stage centrifugal pump located down the well.

A standard gear box is mounted at the well head and a universal joint bolted to the extended shaft. To solve the problem of proper alignment, two such universal joints are bolted to either end of a standard truck drive shaft, the opposite end of which is connected to the output shaft of the engine.

A concrete foundation was poured around the well and extended to include the engine foundation which was elevated as shown. Bolts hold the engine in position. This is an ideal hookup for such an engine since the load is constant during pumping operations which are continuous.

HILLS AND ROCK of Georgia made difficult pipelining for Houston Contracting Company, which laid 532 miles of line for Southern Natural Gas this past summer.

Southern Natural Passes The Billion Mark

$76 million expansion program is nearly complete. System now has 4127 miles of line.

AMERICA WAS reveling in booming prosperity in 1928 when plans began to jell for a pipe line from the Monroe and Richland, La., gas fields to serve Birmingham, Atlanta, Montgomery, Macon, and other southeastern cities.

But despite the golden promise of the skyrocketing stock market there was considerable head shaking at the idea of building an expensive pipe line to a section of the country which seemed to lag behind the economic parade.

Had it not been for the long range vision of a group of men who started with only a pencil line on a road map, the Southern Natural Gas success story might never have been.

However, it was anything but a success story at first. For the infant pipe line company began operations in 1930 as America was wallowing in the depths of a depression.

In fact, the company found it necessary to go into receivership (along with many another young business concern) from which it emerged on January 1, 1936 as the Southern Natural Gas Company. As the reorganized company started out, the southeast was flexing its industrial muscles. And since those early struggling days the southeastern U. S. and Southern Natural Gas Company have come a long way together.

When gas first moved through its lines in 1930, Southern Natural Gas Corporation was serving 43 cities and towns in Alabama, Mississippi, and Georgia. Three compressor stations with a total of 15,000 horsepower maintained pressures of around 400 pounds per square inch on the 1250 miles of line. System capacity was 100,000 Mcf.

By 1936 two new compressor stations had been built and new engines added to existing stations as line capacity rose to 125,000 Mcf. System capacity was enlarged in every succeeding year until by 1942 when war shortages largely stopped construction the system capacity stood at 215,000 Mcf.

Expansion Continues. The postwar years of 1945-46-47 saw continued expansion to 294,000 Mcf with a number of new cities and towns being added.

And since then an expansion program has either been in progress or on the drawing boards every year. By the end of 1948, system capacity stood at 420,000 Mcf.

Completion of Southern Natural Gas Company's present $76,000,000, three year expansion program next year will find quite a different picture from the original 1250-mile system with a total of 15,000 compressor horsepower and 100,000 Mcf capacity.

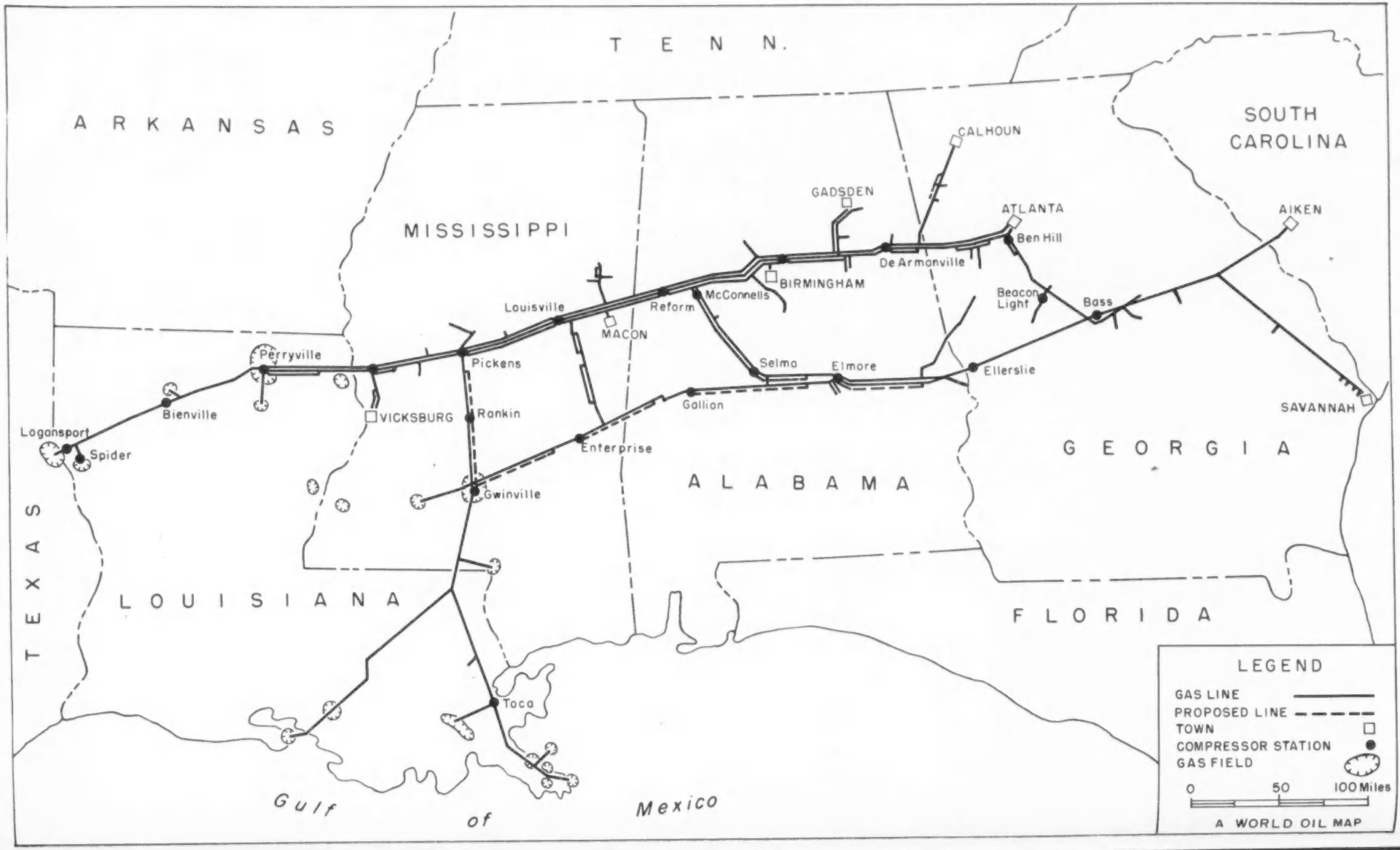
For this latest expansion will bring a system with 4127 miles of line, 22 compressor stations with a total horsepower of 160,170 and a daily delivery capacity beyond a billion cubic feet. More than 230 cities and towns will be served directly from Southern Natural lines.

A glance at the system map will indicate the magnitude of this latest and greatest in a series of Southern Natural expansion programs aimed at meeting the growing demand for natural gas.

To tap rich new supplies of gas in south Mississippi and southeast Louisiana, some 370 miles of new lines ranging from 24-inch to 4-inch are

Map of the Month

SOUTHERN NATURAL GAS COMPANY



being laid from Gwinville, Miss., with two legs running down to the offshore waters of the Gulf of Mexico.

To extend the present system, 126 miles of 16-inch line are being laid from near Macon, Ga., to Aiken, S. C., with a 14-inch lateral from this line running 120 miles southeast to Savannah, Ga.

And to increase the capacity of the existing system, some 500 miles of loop lines are being completed now or will be built next year.

A significant feature of the new lines is the 1200 pounds pressure at which most of them will operate. For in this latest expansion program Southern Natural has carried on with its pioneering in long distance high pressure lines.

Setting the Pace. Widespread interest was created in the pipe line industry in 1941 when Southern Natural built a 131-mile, 14-inch supply line to carry gas from the Logansport gas field to Monroe at pressures of 1200 pounds. With a capacity of 100,000 Mcf per day—more than all of Southern Natural's original system—this line proved completely satisfactory and is considered the original pacesetter for many of the high-pressure lines being built by other companies today. Installation of additional facilities has increased capacity of this line to 160,000 Mcf per day.

Southern Natural was also the first to build a 1200 pound line for long distance transmission. This was the 180-mile, 18-inch line from Gwinville to Elmore which continues as a 16-inch line to a point near Macon, Ga. The map shows that this same line is the one being extended to Aiken, S. C., in the current construction program.

Proposed or under construction are a number of connecting pipe line systems to be owned and operated by others but supplied from Southern Natural's lines. Typical of these is a system to take gas at Aiken and transport it to such South Carolina cities as Columbia and Charleston.

Guarding against delivery interruptions in Southern Natural's system are the many miles of first and second loop lines and the grid-like nature of most of the system. Running roughly parallel, the north and south lines are cross connected at four points.

In addition the company has cross connections with United Gas Pipe Line Company, Transcontinental Gas Pipe Line Corporation, and Texas Eastern Transmission Corporation.

Another interesting feature of Southern Natural's operations is the high ratio of summer loads to winter loads. This is true because of the heavy interruptible industrial loads which can be cut off during cold weather days of peak demand. Among these large industrial customers are steel mills and electric generating plants.

Top Southern Natural Gas Company officials are: C. T. Chenery, chairman of the board; C. van den Berg, vice chairman of the board; C. P. Rather, president; H. D. McHenry, vice president and secretary; H. E. Jackson, vice president and treasurer; Howard M. Erskine, John M. Starke, and J. B. Milmoe, vice presidents.

In the operating department, Oliver W. Clark is general superintendent; C. M. Hunter, assistant general superintendent; O. A. Tooley, superintendent of pipe lines; B. O. Fields, superintendent of compressor stations; and C. E. Terrell, superintendent of measurement.

Robert G. Kenan has charge of industrial relations.

Louis N. Brown is chief engineer. W. T. Ivey is chief planning engineer.

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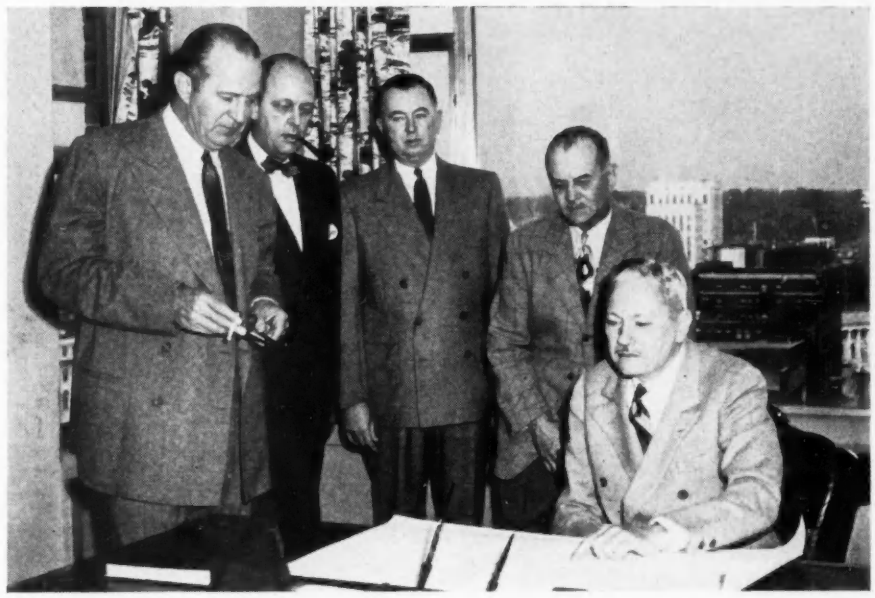


PLANNING EXPANSION PROGRAM are Southern Natural officials, left to right, C. P. Rather, president; Louis N. Brown, chief engineer, B. O. Fields, superintendent of compressor stations; C. E. Terrell, superintendent of measurement, and C. van den Berg, vice chairman of the board.

C. T. Chenery

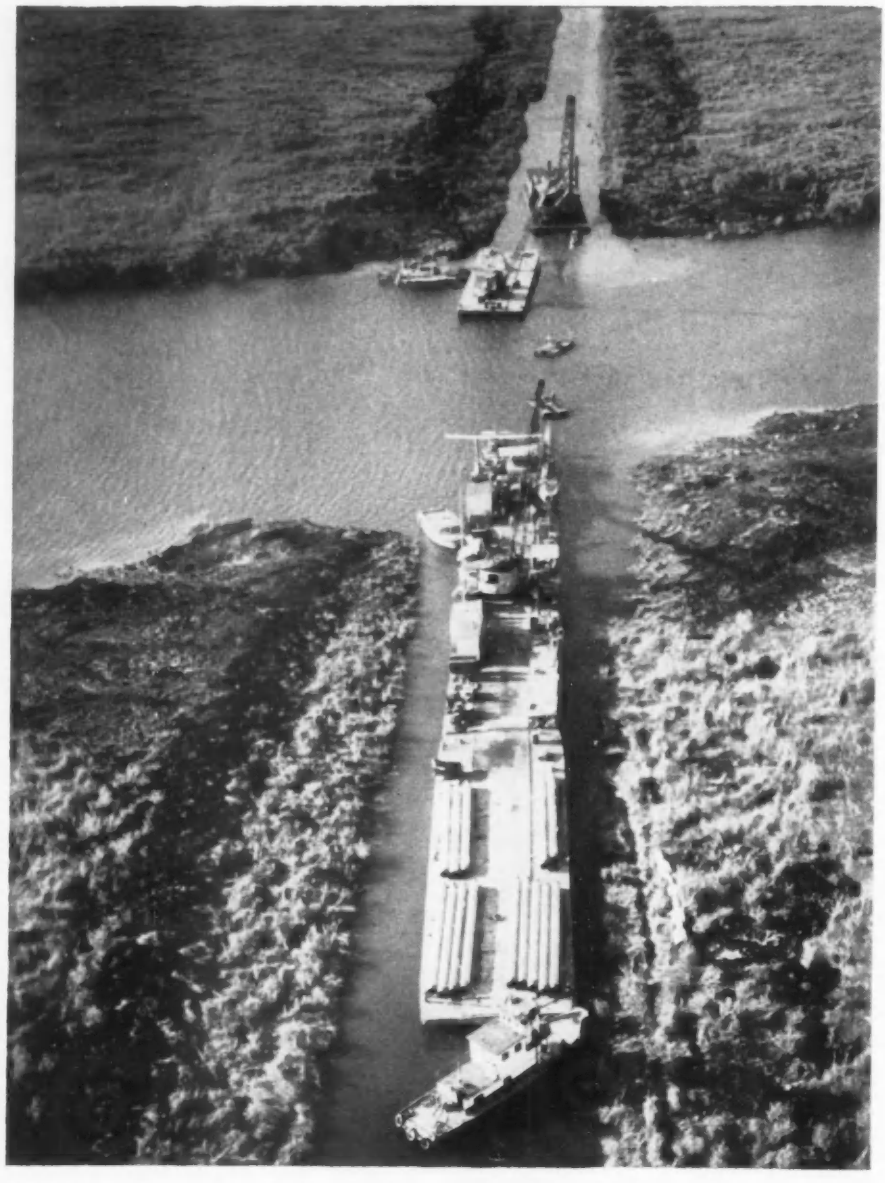
O. W. Clark

C. M. Hunter

O. A. Tooley

R. G. Kenan

TOP OFFICIALS of Southern Natural above are: Chenery, chairman of the board; Clark, general superintendent; Hunter, assistant superintendent; Tooley, superintendent of pipelines; and Kenan, superintendent of industrial relations.



PIPE-LAYING BARGE CROSSES INTERCOASTAL CANAL. Work on this barge, which is traveling toward lower portion of photo, is completed at five stations in this order—line-up, stringer bead and hot pass, filet weld and lace, X-ray and prime, hot coating, and concrete field mold.

160 miles of new line . . .

MAJOR PORTIONS of Southern Natural Gas Company's current $76,000,000 expansion program are being completed this year, second year of the three-year program.

Extension of the existing system to serve Aiken, S. C., and Savannah, Ga., and the laying of some 500 miles of loop line are a big part of the story. But perhaps the most dramatic and unusual is the extensive new supply system into the gas-rich marshes, swamps and offshore waters of south Louisiana.

Some 210 miles of this supply system was laid through terrain suited to conventional types of pipe line construction, but about 160 miles of line had to be laid in water, either in canals dug for the purpose or along the bottoms of existing bodies of water.

Preliminary studies of the project began more than four years ago but the FPC application wasn't filed until early 1952.

In planning the project Southern Natural Gas Company executives first sketched out probable routes on a map then followed through with comprehensive aerial photo surveys, and in April 1952, Ford, Bacon and Davis Construction Corporation survey crews began the basic survey.

Only ordinary difficulties bothered the survey men on the solid land portions of the line but when it came to the treacherous marsh and open water of the East Leg on down from Lake Pontchartrain and the thick woods rising out of the West Leg swamps below the Mississippi River it was a different story.

Helicopters Help. Hovering helicopters and the ungainly marsh buggies proved the answer to this problem. For the "whirley birds" could jump from point to point while the snorting marsh buggies were equally at home on quiet waters or leaving tracks through the waving marsh grasses growing out of the slime.

So flying, riding, and often just plain sloshing through on foot, the surveyors staked out the routes after seven months of hard work.

Back at Southern Natural Gas Company headquarters in Birmingham, final decisions were being reached on the thousand odd problems which go with a project of this size and type; problems involving protective coating, compressor station details, measurement station design, cathodic protection, communications facilities and many other things.

The Purchasing Department, for example, had to arrange to buy hundreds of miles of pipe of widely varying sizes and descriptions. A good sample of the magnitude of this job was the order placed with a Houston pipe mill for some 220 miles of 20-inch steel pipe. Production at this mill (just one of those turning out pipe for the expansion program) began in early March and ran steadily until late April.

A new record for the Port of Houston was set when this pipe moved out on barges. For the 42,000 tons of pipe involved was the largest single shipment of any material ever to be handled at this port.

The barges delivered some 150 miles of pipe in varying sizes to concrete coating yards at Harvey and Morgan City. At Harvey the pipe began to move through the sprawling yard March 17 and ran until September 6. The Morgan City operation ran from March through July.

Pipe Coated. In these yards all the pipe was double coated and double wrapped with glass felt. Then it moved to the croncreting machines where concrete coatings ranging from 1 to 2½ inches was sprayed on.

To give added weight, varying proportions of barites were used in place of or with the sand in mixing concrete for most of the coating. This ranged from 100 percent barites used on the nine mile Lake Pontchartrain pipe to no barites on smaller lines.

The 20-inch by 11/32-inch wall pipe with 2½ inches of 100 percent barites concrete coating had a dry weight of 313 pounds per linear foot and with 50 percent barites concrete coating a dry weight of 282.1 pounds per linear foot.

G. T. Dierking served as Ford, Bacon and Davis project manager with M. S. Trimble as his first assistant. A. J. Evans started out as Chief Inspector but shifted to a job as boss on the two Mississippi River crossings and Pete New replaced him.

Southern Natural men on hand included Brigadier General P. H. Timothy as special project engineer. General Timothy who has been with Southern Natural on special projects since he retired from the Army brought a wealth of technical know-how based on his long study of the project and his years of experience with the Army Engineers on the big river.

Operations Start. Spring of 1953 found both the conventional-lay and water-lay operations getting under way.

Houston Contracting Company spreads laid virtually all the conventional type lines. This included 68 miles of 24-inch from Gwinville, Miss., to Franklinton, La., where the line split off into 20-inch East and West Legs. Some 70 miles of line on the West Leg and 40 miles on the East Leg were laid by conventional methods.

The rest of the construction—nearly all of it of the water-lay type—was by Brown and Root, Inc., and by their subcontractors.

First came the draglines, digging 40 foot wide canals through the marshes of the fast leg. But before the draglines could dredge through the swamps of the west leg, natives working from tiny pirogues in the stagnant swamp water chopped a path through the dense woods.

DIFFICULT JOB. Here a Louisiana native chops down a tree while standing in a pirogue. The average person hardly can keep the small boats upright while sitting down. But these skilled men made good progress in clearing right-of-way through cypress swamps.

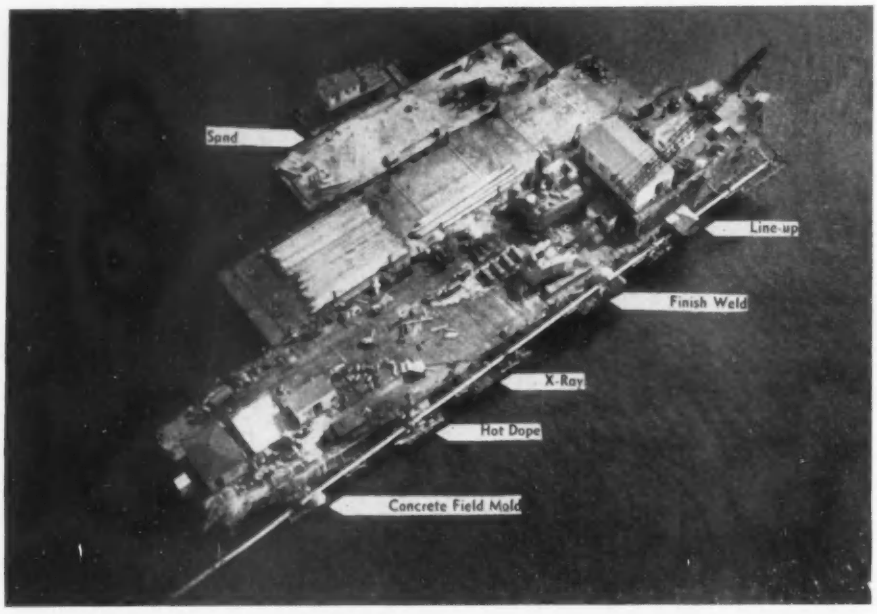
The flotation canals were dug to a minimum of six feet below mean sea level; then the dredges returned to dig the actual pipe ditches 10 feet from the side of the 40 foot flotation canals. The pipe ditches were deep enough to leave the top of the pipe at least six feet below mean sea level.

Central performers in the entire operation were the four lay barges used in shallow water laying and a converted former Navy landing ship used in deeper offshore waters.

Actually each lay large consisted of two 110 by 28-foot barges hinged together. Some compartments in the back barge of the pair were flooded with water to bring the end of the deck to the water level.

A pipe barge was tied on to the

DREDGING JOB. The second step in clearing the right-of-way was to dredge 40-foot-wide canal after woodsmen had cleared trees.



LOOKING DOWN ON HERMAN B. This is a converted Navy landing ship hull adapted to offshore laying. It was used to lay portions of the Breton Island and Main Pass lines.

front of the lay barge combination and a sand barge behind.

The pipe moved along over tiltable shoes equipped with horizontal and vertical rollers. Pipe was lined up and welded at the first work station, the weld completed at the second work station, the weld area primed and X-rayed at the third station, hot dope and glass fiber applied at the fourth station and a concrete field joint poured at the fifth and last station before the pipe entered the water, sliding over an A-frame mounted roller swung from the sand barge.

The "Herman B."—designed originally as a Navy landing ship—was used in laying some 14 miles of the offshore Breton Island line and about two miles of the offshore line to the Main Pass producing platforms.

Basic laying procedure on the "Herman B." was the same as on the shallow water lay barges except that the handling platforms allowed the pipe to enter the water at a much steeper angle made necessary by the deep water.

Huge anchors attached by long steel cables held the big barge in place. The cables were winched in and out to move the barge and a tugboat shifted the anchors every few hours as needed.

Less unusual was the inclined platform work barge used on the two Mississippi River crossings put in by crews under Art Evans. On this inclined platform the previously triple-jointed lengths of pipe were welded and 1230 pound cast iron river clamps installed.

River Crossings. Definitely unusual was the river crossing technique used. Instead of the commonly accepted straight line or river-wide curve, these lines were laid in a series of relatively sharp curves along the bottom.

This method, which was first designed by General Timothy for an earlier Southern Natural crossing north of Vicksburg, is designed to provide enough slack pipe to adjust to the sometimes drastically changing bottom of the big river.

Since four 12-inch lines were laid at Carville on the west leg and two at Star Point on the Barataria line, this new type crossing required precise spotting of the curves to avoid pipe tangles. This spotting was done from the last lowering-in barge, using a sextant to take bearings on shore markers then plotting those bearings on a chart.

Countless special problems arose on the project but space permits touching on only two of them. At Bayou Boutte, for example, the west leg crossing plans called for a pipe ditch 10 feet below the 50-foot bottom of the 760-foot-wide bayou. Since the bayou is a popular waterway, spoil from the ditch had to be dumped on the banks (it was feared the spoil would fill the mouth of the bayou). So a king-sized dredge with a 240-foot boom (said to be the longest such boom in the world) was brought in to dig this crossing.

On the south edge of Lake Pontchartrain it was necessary to run the east leg line under a double railroad track and under a paralleling shallow canal beyond. This meant building a heavy steel cofferdam on the lake side to keep out the lake water while the below-the-surface drilling took place.

Some difficulty was experienced in building a cofferdam strong enough to withstand the outside water pressure. Then when the actual boring or drilling began and the drill and casing reached a point below the shallow canal, the bottom of the canal literally "fell in," water flooded through the casing and workmen scrambled out of the cofferdam. To solve this problem it was necessary to build a similar cofferdam on the canal side of crossing and end the casing in the canal with watertight seals on each end.

Despite the many problems, completion of the entire south Louisiana supply system including a 3300 horsepower compressor station on the east leg, receiving and measurement platforms and communications facilities is expected before December 1.—**The End.**

SOUTH LOUISIANA extension of Southern Natural gas line. The two legs cross more than 160 miles of open water and swamps.

PIPE LINE PROGRESS

Dope gang preparing a string of A. O. Smith 26-inch welded steel line pipe for lowering in on the West Texas Gulf Pipe Line.

Biggest Inch to carry 381,000 bbl. per day from Permian Basin area

The West Texas Gulf Pipe Line, completed last February, is the largest single carrier of crude oil in this country. It has 465 miles of 26-inch pipe which extends from Colorado City in west Texas to Lucas, just outside Beaumont.

Present capacity of 301,000 barrels per day is being increased to 381,000 by the addition of intermediate pumping stations. Ultimately, capacity can be increased further to an estimated 440,000 barrels per day.

Crude oil from the Permian Basin area, containing more than 20% of the nation's oil reserves, is delivered to the Beaumont area and, through a 20-inch branch of 112 miles, to Longview, Texas, where it connects with other pipe lines serving Great Lakes and Ohio River valley refineries.

A considerable mileage of the 26-inch line is of A. O. Smith welded steel line pipe produced in Milwaukee and Houston. We are proud to have contributed to the construction of this, the Biggest Inch, as we have also to virtually every important petroleum products pipe line in the world.

A. O. Smith Line Pipe is available in a complete range of sizes and wall thicknesses, from 8⅝-in. to 36-in. diameters.

FIRSTS by A. O. Smith: Welded line pipe • Internally expanded pipe • Light-wall large-diameter pipe • World's largest producer of large-diameter welded steel pipe.

The A. O. Smith Casing Mill is operating at capacity to supply vitally needed casing for the Oil and Gas Industry.

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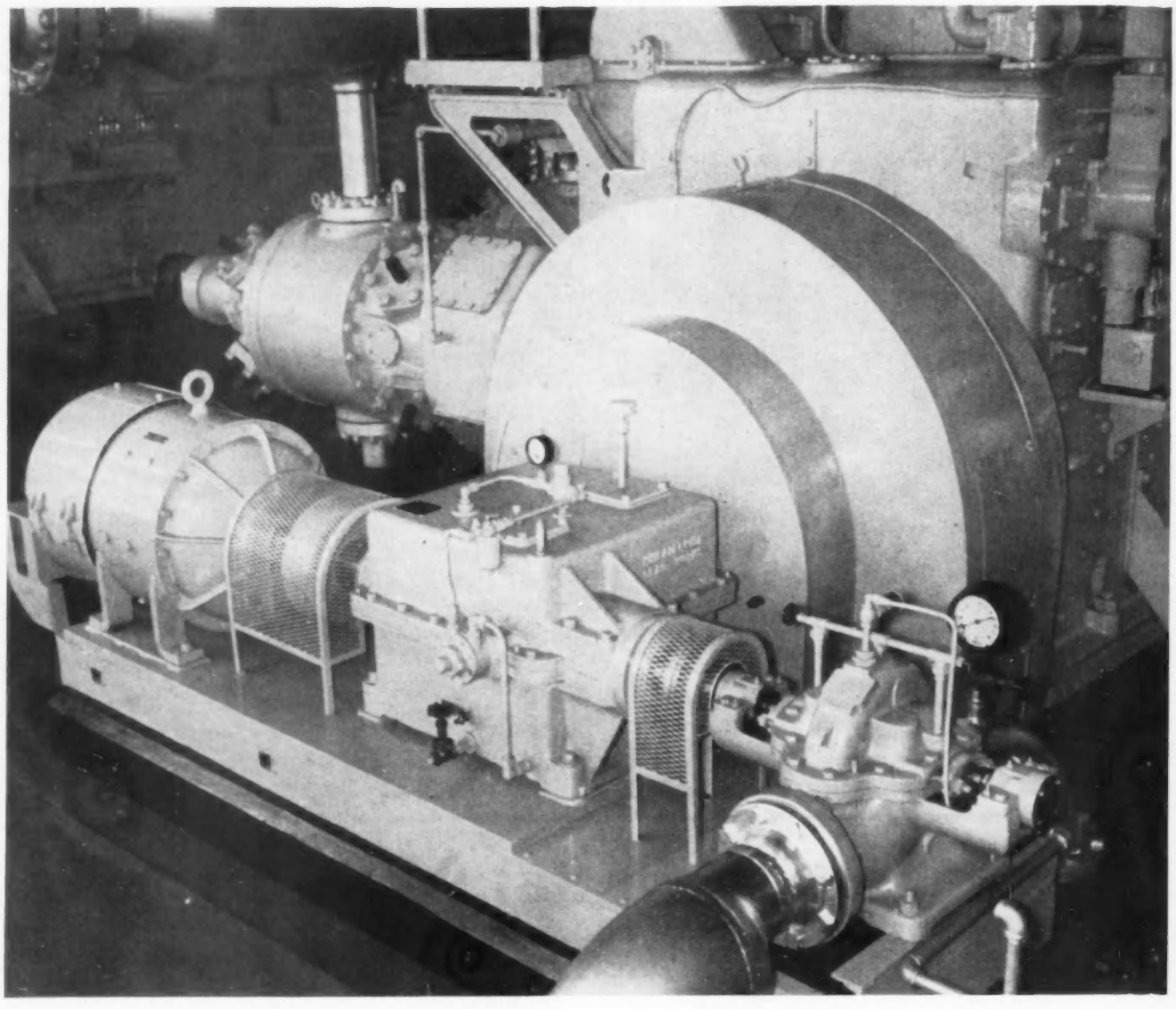
DEPENDABILITY THROUGH RESEARCH AND ENGINEERING



FROM THE FLYWHEEL SHAFT comes power for driving the jacket water pump at right and the DC generator at left, which in turn furnishes power for the cooling fans. Thus, each engine is a complete unit requiring no outside source of auxiliary power.

By adding unitized drives to engines so that each engine drives its own auxiliaries, Texas Gas Transmission shows how to . . .

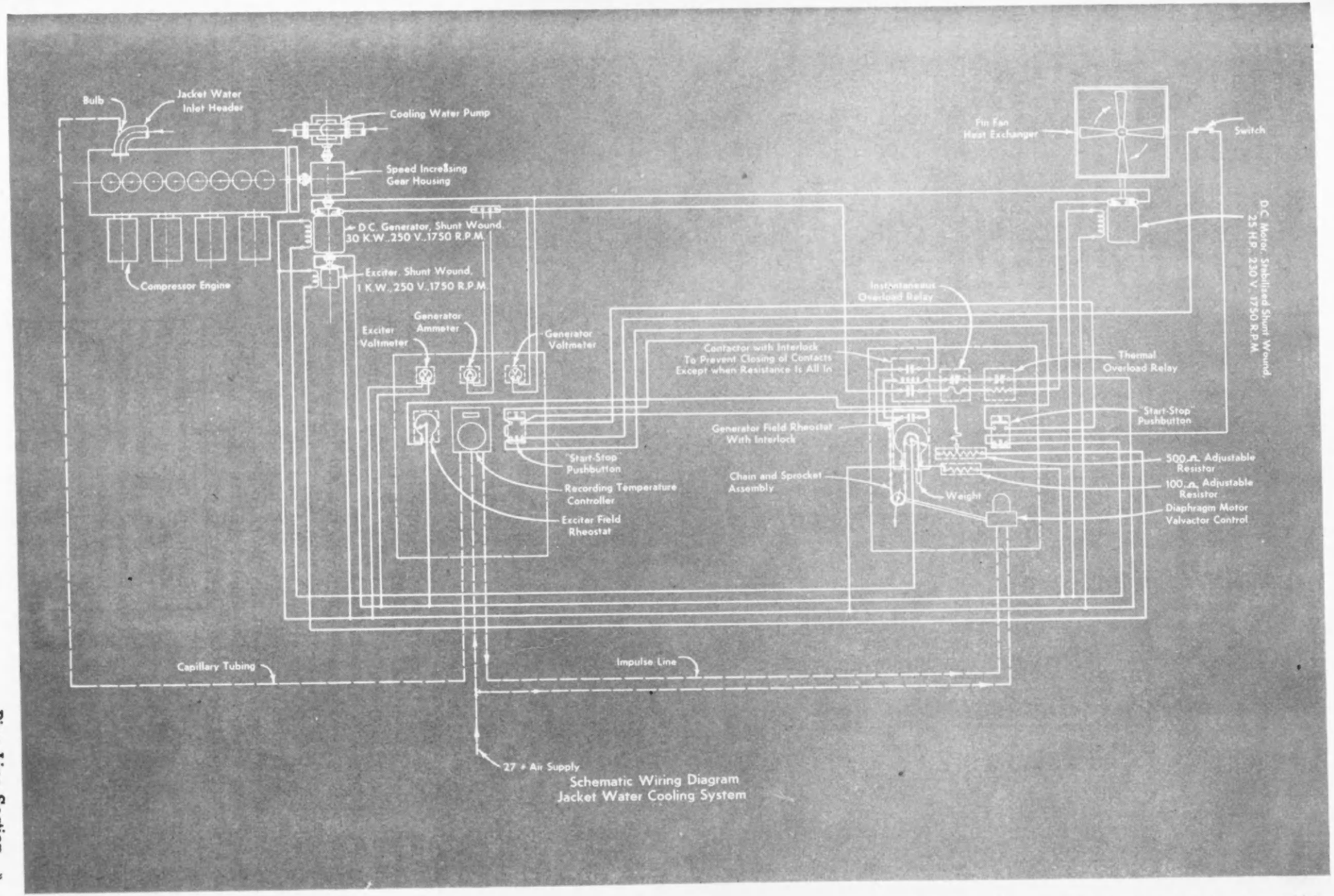
Save $20 Per HP on Station Costs

By DONALD M. TAYLOR, WORLD OIL Staff

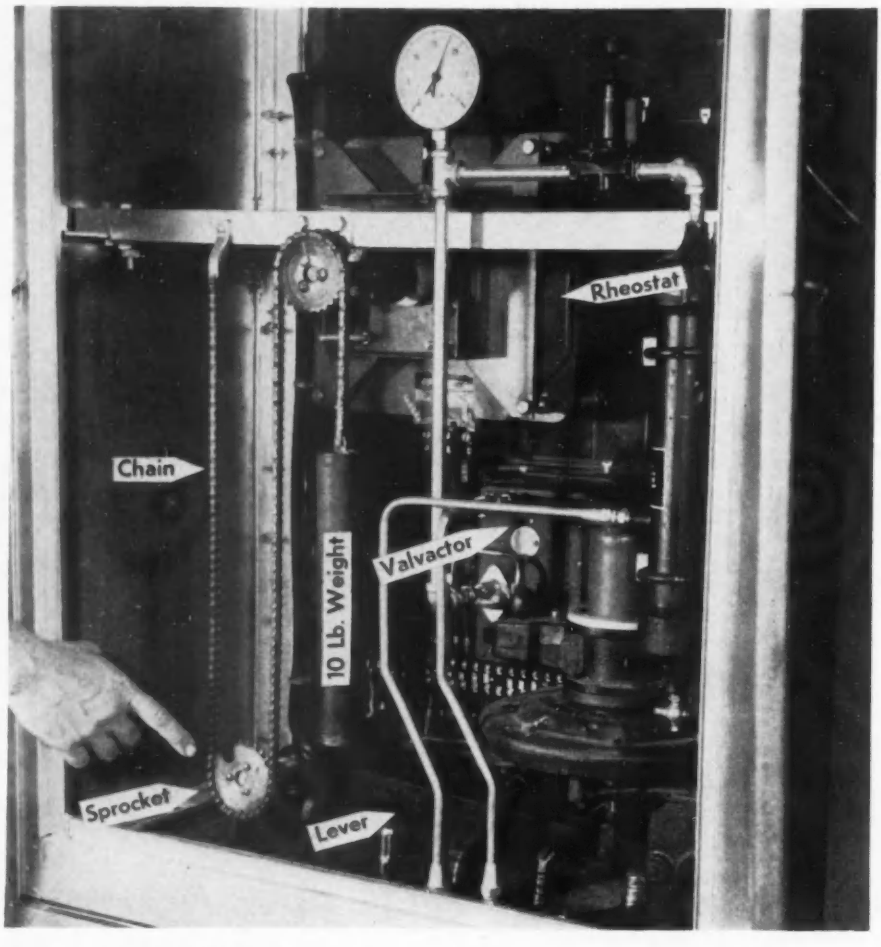
TEXAS GAS TRANSMISSION COMPANY has developed a unitized drive for cooling and pumping engine jacket water that has cut compressor station costs about $20 per horsepower. In addition, it has reduced compressor station fuel consumption.

Aside from these two marked advantages, two years experience with the new drive has shown that:

- It controls jacket water and oil temperatures with a higher degree of accuracy than conventional equipment.
- It saves station labor—eliminating the conventional power plant.
- It simplifies station additions—each engine is a complete unit and tie-in to circulating system



SCHEMATIC WIRING DIAGRAM of jacket water cooling system. Armatures of the DC motor and generator are connected through a Ward-Leonard circuit so that the power which the generator develops can be controlled by field exitation.



INSIDE THE DOGHOUSE where controls for cooling water are located. Temperature controller actuates rheostat which in turn regulates field exitation for motor-generator set, insuring that power taken from engine for cooling will not fall under minimum needed.

is easily effected through valves and flanged fittings.

- It eliminates the unfortunate modulus that exists between auxiliary power units and engine auxiliary power requirements.
- Energy from auxiliary fuel goes through fewer steps in reaching drive shafts.

Basically, the new drive is simple. Each compressor engine drives its own oil pump and jacket water pump; and through a DC motor-generator set it drives its own cooling fan. In addition, each engine has its own cooling water system with individual surge tank and atmospheric cooling section. The power for the water pump and cooling fan comes off the flywheel shaft through a double cut gear box. As shown in the illustrations, both pump and DC generator are located near the engine in the compressor building.

The big advantage of this arrangement is that it eliminates the conventional compressor station auxiliary building making each engine a complete operating unit.

Texas Gas has had these units in operation for two years, and their performance has been studied carefully. Fortunately, so far as these studies are concerned, this equipment is installed on all engines at alternate stations. This makes it easy to compare the drive with conventional installations, since there are adjacent stations that have the same kind of engines working under similar loads, with the chief differences being the unitized drive and age of the engines.

Credit for the development of this drive goes to J. Ray Fisher, Texas Gas Transmission Company's superintendent of compressor stations; J. B. Eaton, Jr., assistant superintendent of compressor stations, and Walter E. Brown, design engineer.

Of course, it was not for test purposes that this equipment was installed in the alternate stations. As a matter of fact, the stations that now have the unitized drive originally were designed in 1949 with conventional auxiliary buildings. They were part of a general expansion program that called for the addition of six new stations to be constructed between existing stations with a total horsepower of 52,250. But by the time the program had been approved by FPC, the outbreak of the Korean War was only weeks away. By the time purchasing of materials got under way, the war was on, and the expansion program met the full impact of the rise in prices that came at that time.

For this reason, designs were reviewed with an eye toward cutting costs in order to stay within the original budget. And one of the first things to come under the careful scrutiny was the station auxiliary building with its costly power plant, switch gear and battery of circulating pumps. It was estimated that for about $5000 per unit, each engine could be equipped to drive its own auxiliaries; saving about $150,000 per station. Although this meant a slight reduction in over-all station horsepower, it offered a means of improving the efficiency of station operation.

As it turned out, the savings per station ran more than the original estimate, and the over all fuel consumption is running 6 to 7 percent lower. Almost half of this saving in fuel is attributable to the operating economy of the unitized drive. The auxiliary building as such is eliminated. Instead, there is a 75 kilowatt transformer bank and cubicle to handle power purchased for lighting and miscellaneous uses. Each station has a 75 KW standby generator in event of power failure. Yet, another unusual feature of the stations is that conventional rectifying equipment for engine ignitions is absent; instead, each engine is equipped with an ordinary truck-type battery. Charges on the batteries are maintained by a small trickle charger, similar to those found in automobile service stations. Experience has shown that one of these batteries can supply ignition for an engine for a period of 100 hours without additional charging.

Economies of Operation. Fortunately, the savings that resulted from

SAFETY...first and fast

This team of Caterpillar D8 Tractors with MD8 Pipe Layers is lowering in 26-inch gas line near Greenville, Miss. On another stretch near here these husky machines, which are owned by H. C. Price Co. of Bartlesville, Okla., crossed three-quarters of a mile of flooded rice field in only two hours. That was real speed, but it was made with full regard for the safety of the pipelaying crew.

Accuracy of control is vital in this work. The Cat* MD8 Pipe Layer has separate brakes and clutches on both boom and load line drums. Conveniently placed operating controls and a special, heavy-duty Caterpillar transmission mean precise placement of the pipe—and "built-in" safety for the men on the job.

The Cat D8 Tractor and MD8 Pipe Layer are a mighty combination. They have the balanced weight and power, the surefootedness in sticky going, the *muscles* to stay on the job with a minimum of maintenance. The long-wearing Diesel engine in the D8 develops an honest 148 HP, on low-cost No. 2 furnace oil.

Many spreads have standardized on Caterpillar equipment. They find, no matter where their jobs take them, that they can count on fast service from skilled Caterpillar Dealers.

Ask your nearby dealer for an on-the-job demonstration of Caterpillar track-type Tractors and Pipe Layers that fit *your* requirements.

Caterpillar Tractor Co., Peoria, Illinois.

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**NAME THE DATE...
YOUR DEALER
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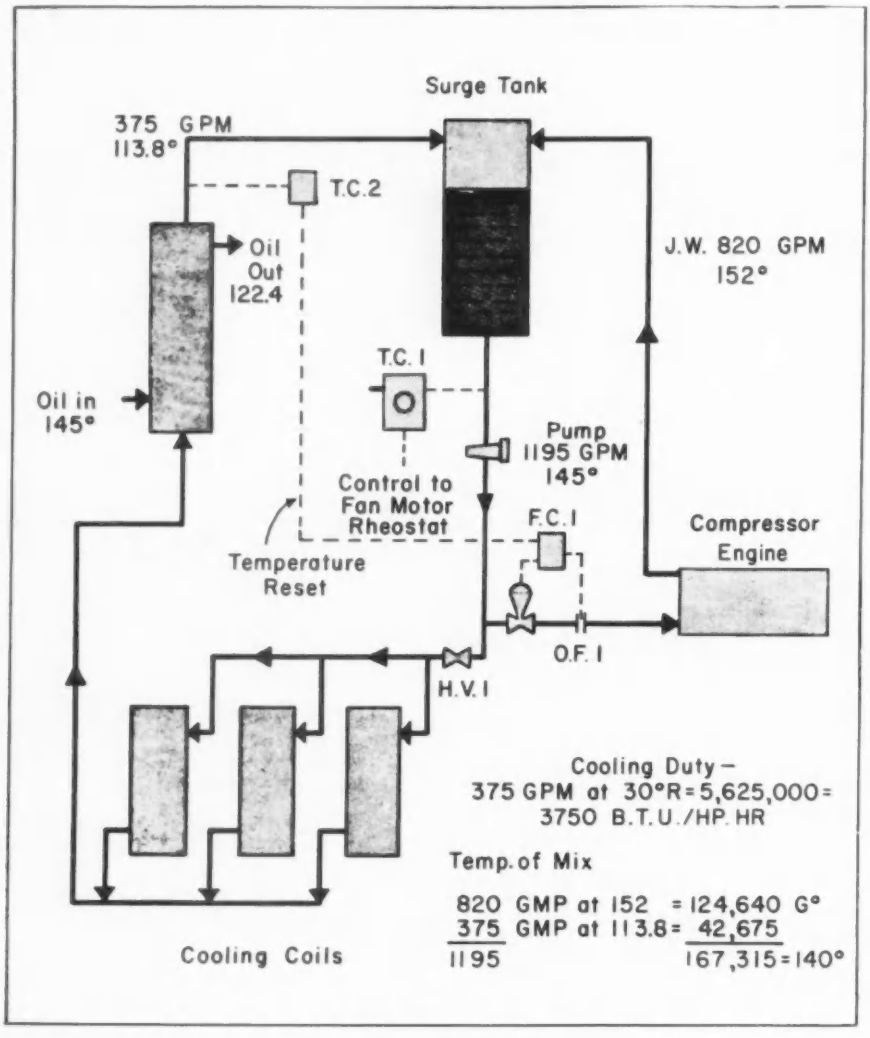


SCHEMATIC DIAGRAM OF COOLING WATER FLOW. Water from engine pours into individual surge tanks at 152° F. and mixes with 114-degree water from oil cooler. This mix, which is 140° F., splits with 820 going to engine jacket and 375 going to cooling coils and oil cooler. Speed of fan regulates temperature of cooling water.

this new installation did not end with its initial cost. The fuel records for two years of operation conclusively show that the stations equipped with this new drive have operated on less fuel per horsepower hour. Explanation for this lies in the fact that conventional stations are usually saddled with an unfortunate modulus between the size of auxiliary power units and individual compressor engine requirements; and too, energy from fuel in an auxiliary building must go through more steps in reaching a driven pump shaft.

Usually the auxiliary generator units have 250-370 horsepower, each sized to furnish auxiliary power for three or four compressor engines with total horsepower ranging between 4000 and 6000. The net result is that when a compressor engine is taken off or placed on the line, there is not usually a proportionate decrease or increase in auxiliary power on the line. For example, in a station where two generator units and four cooling water circulating pumps are sized to carry the load imposed by six 2000 HP compressor engines operating under full load, the shutting down of a single compressor unit will reduce the station horsepower from 12,000 to 10,000; but will not materially reduce the fuel consumption and equipment usage in the auxiliary building. On the other hand, if one auxiliary generator will carry three of the large engines, the operator of four engines requires two auxiliary units.

To overcome this lack of modulus between power generating units and compressor engines, the ideal auxiliary building should have generators and pumps sized to take care of individual engines. But this would require larger buildings, more yard piping, additional maintenance and greater initial expense.

In contrast with the conventional stations, when an individual compressor engine with a unitized drive is taken off the line, the jacket water circulating, the oil pump and the cooling fan immediately shut down. There are no valves to turn, no switches to throw. Moreover, when the engine is operating under a reduced load, the jacket water circulating pump requires less power from the engine. As for the electric generator-motor setup on the cooling fan—it is operated by automatic control and takes only the amount of power from the engine that is needed to cool the water. In cool weather, meters on the circuit show that the fan motor takes only 2 or 3 HP from the engine.

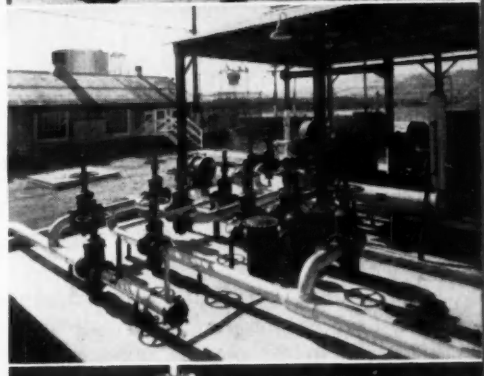
Second explanation for the increased efficiency of the unitized drive over the conventional power plant is that energy from the fuel goes through fewer steps before reaching its work. For example, in the usual auxiliary building setup, the energy from the fuel must pass from the engine to generator to switch gear to motor to pump. The engine will run about 32 percent efficient; the generator about 94 percent; switch gear 99 percent; and motor 85 percent efficient. This gives an over all fuel efficiency of 25.3 percent on the drive coupling of the pump.

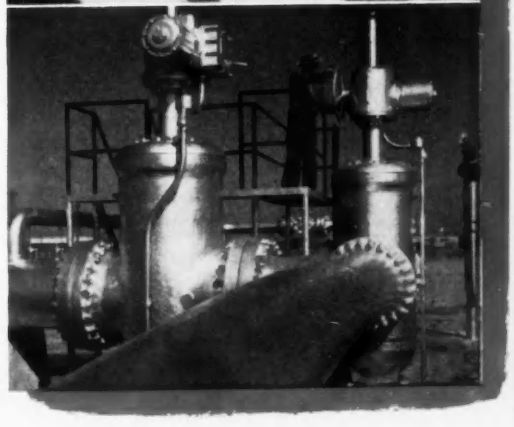
With the unitized drive, the energy from the fuel passes from compressor engine to gear box to pump. If the engine has an efficiency of 32 percent, and the gear box an efficiency of 98 percent, the over all fuel efficiency on the drive coupling of the pump is 31.4 percent.

There is still another important factor to be considered. The auxiliary building or pump building is usually located some distance from the engines, giving unnecessary friction losses. With the unitized, the round trip from engine to cooling oil or small individual surge tank is slightly more than 100 feet.

In the two years Texas Gas has been operating this new drive, many performance tests have been run on the engines and stations to determine the drive's economy. In two stations,

NO MORE TURBULENCE . . .
NO MORE PRESSURE DROP
THROUGH HERE
THAN HERE





You get the same turbulence and the same pressure drop through a W-K-M Pipeline Valve as you get through a length of pipe the same I.D. and length as the valve conduit.

No Turbulence means a minimum of wear at the gate and seats—resulting in low or no maintenance costs involving these parts. **No pressure drop** means that the pump power is concentrated on the transmission of gas, oil, and petroleum products, not wasted pushing it past obstructions.

W-K-M Valves offer more economies in maintenance costs and in efficient performance than any other pipeline valve—that's why Most of The World's Newest Pipelines are Tied Together with W-K-M Valves.

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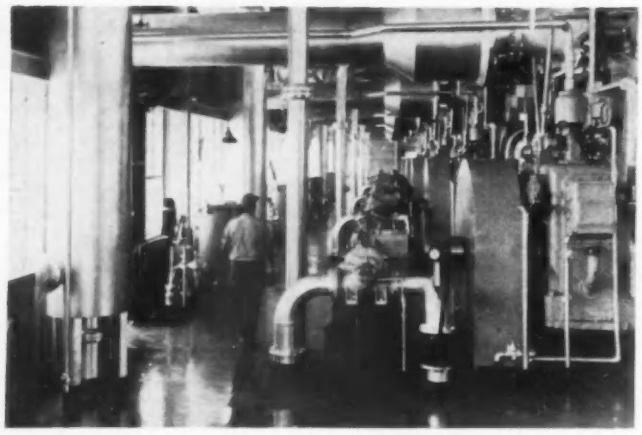
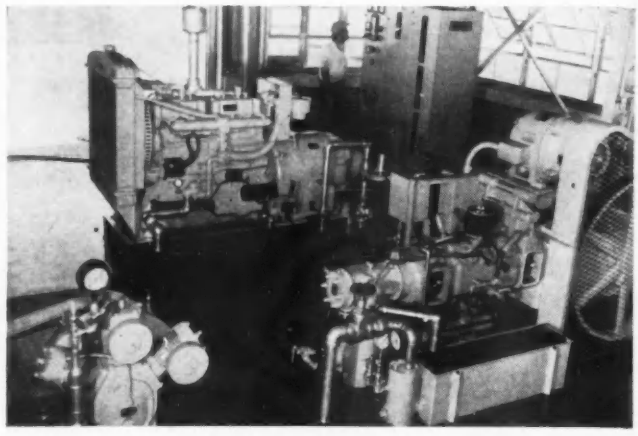
W-K-M Valves

W-K-M Pipeline Valves have:
Full-Through-Conduit Flow • Positive Leverlock Gate Control
Pressure Seal Bonnet
Ball Bearing Operation • Superfinished Stems



INSIDE COMPRESSOR BUILDING. Note the individual surge tanks on engines at left. Line of unitized drives are in center.



INSIDE AUXILIARY BUILDING. Little equipment is needed. Standby generator at rear near panel. At right and left are starting air compressors.

individual fuel meters have been installed on all engines; and in all stations, the current demand of the fan motors can be read. The latter makes it possible to study the demands of the cooling fan motor-generator set. Results of the studies show that the 1500 horsepower engines seldom use more than 30 HP for water circulation and fan operation even in the hottest weather. And in cool weather, it uses only 15 HP.

In order to gain the maximum efficiency in cooling, two engines can be tied in to the same cooling coils in cold weather. This gives even higher economy.

Principle of New Drive. The principle of the new drive is simple; just as simple, in fact, as driving an automobile's water pump and cooling fan from the engine. In this case, power for the water pump and generator is taken off the flywheel end of the engine through a right angle double cut gear box. It converts the 250 revolutions per minute of the engine to 1750 rpm.

The pump is direct-coupled to the gear box pumping at a rate of 1200 gpm at 20 pounds per square inch pressure under full load. It takes suction from a surge tank that is an integral part of each engine cooling system. The pump's discharge stream is split with about two-thirds of the water entering the compressor engine jacket and the remaining side stream passing through the cooling coils, oil cooler and then into the surge tank. The latter has baffles that mix the side stream with the hot jacket water to produce 140 degree water.

The DC generator is also driven from the angle gear box, through a connecting hydraulic coupling. It is rated at 30 KW and the cooling fan motor it drives is rated at 20 HP. The armatures of the generator and motor are connected through a Ward Leonard circuit. With this arrangement the power that the generator develops can be controlled by the field excitation. This control insures that the power the generator takes from the engine will not exceed the minimum amount needed for cooling. Thus the speed of the fan can be varied from 6 rpm to 266 rpm even though the generator speed may remain constant.

This variable speed fan furnishes the primary control of the cooling system temperatures. A rheostat located in the main exciter circuit between exciter and shunt field of the generator directly controls the revolutions of the fan. The position of the rheostat, in turn, is governed by a temperature controller actuated by a temperature bulb on suction side of the circulating water pump.

TALKING IT OVER. J. Ray Fisher, superintendent of compressor stations, discusses unitized drive operation with Station Superintendent W. G. Wilson, center, and Walter E. Brown, design engineer.

The means by which this controller positions the rheostat is best illustrated by the accompanying drawing and photograph.

Note that there is an over-riding temperature controller that is actuated by outlet of the oil cooler. It takes over to control water temperature by proportioning the flow of water to cooler and compressor when conditions cause the fan speed control to reach either of its extremes. This feature was introduced as an over-riding safety control but to date conditions have not been such that its functions have been necessary.

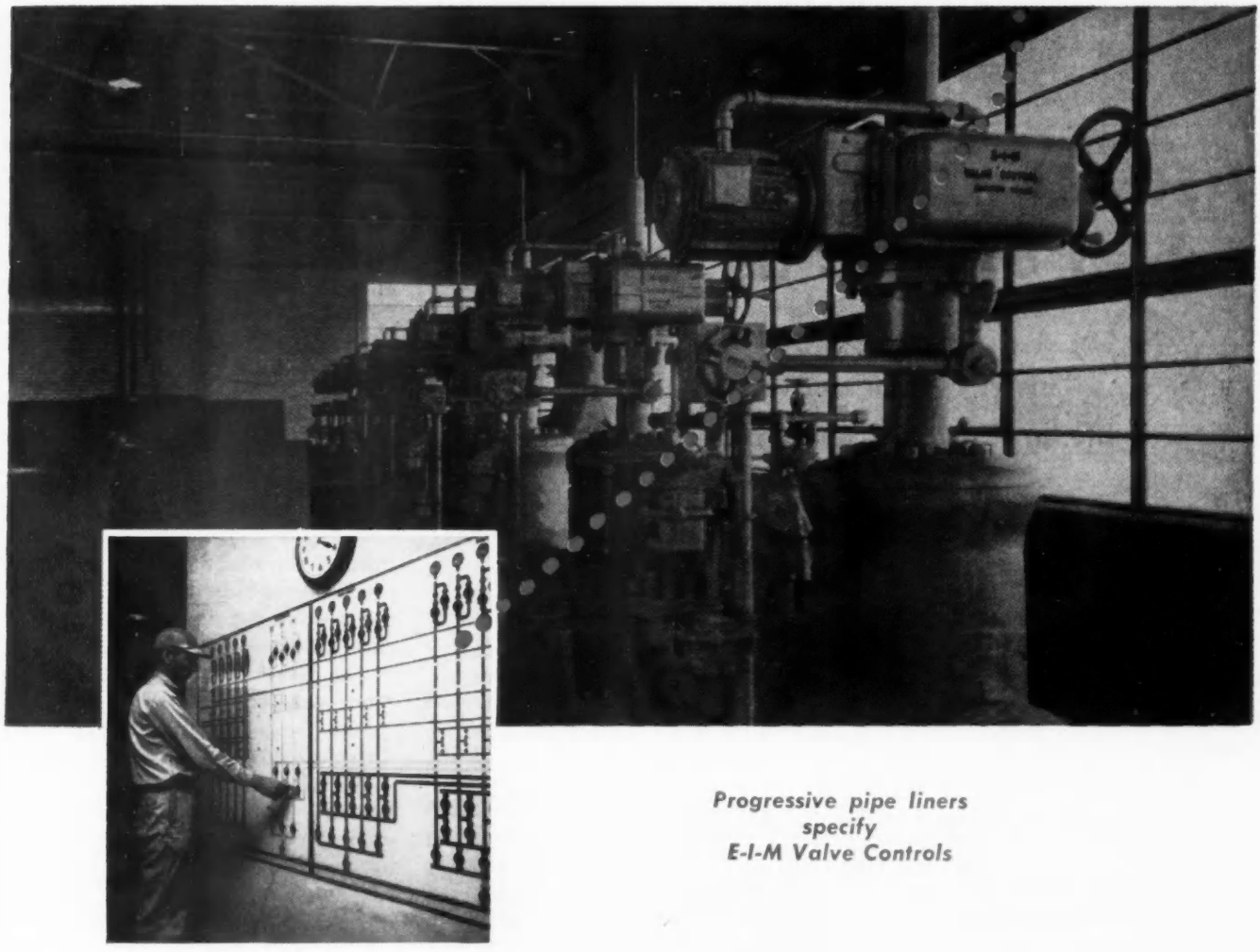
Actual hook-up of the electrical and pneumatic instrumentation is illustrated by the accompanying schematic drawing.

Two other points that have a strong bearing on use of this equipment are maintenance and cost of outside power. In two years operation, maintenance has been limited to the routine care that would be given any ordinary DC motor-generator set. Brushes are inspected twice a year and cleaned once a year.

As for the expense of purchasing outside power for lighting, machine shop and other miscellaneous usage, the cost has been low, since the power factor is almost unity. This power is purchased from various local utility companies. —**The End.**

EFFICIENT, INSTANTANEOUS MOVEMENT

West Texas Gulf Pipe Line Co., like many outstanding transmission lines, makes E-I-M Valve Controls the heart of the modern pumping station—striking a single push-button automatically opens the station block-valve and in sequence the pump suction-valve, pump motor, pump discharge-valve



Progressive pipe liners specify E-I-M Valve Controls

E-I-M Company INCORPORATED

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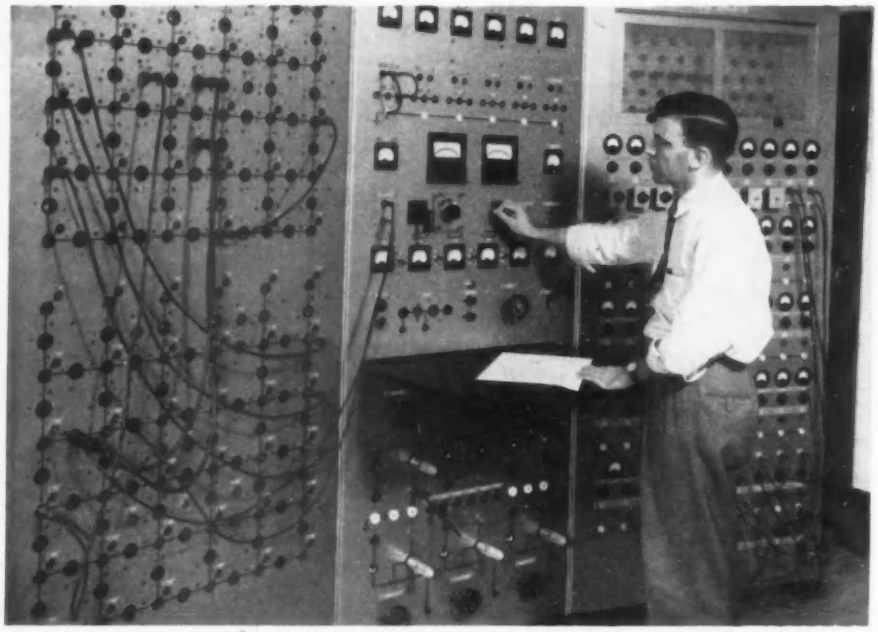


AN ENGINEER STUDIES a problem in fluid flow for a petroleum sponsor. The pipe line has been simulated on the analyzer for correct computation of flow, friction and head loss.

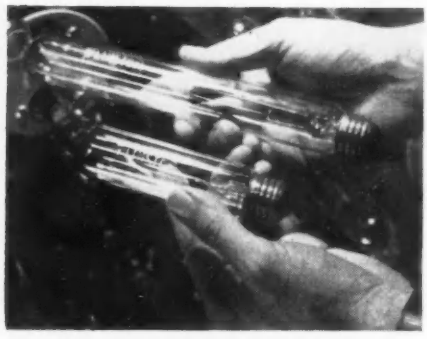
Network Computations Solved 8 Times as Fast

This electronic analyzer makes short work of compressible flow, network analysis and other problems.

By PRICE D. WICKERSHAM, Midwest Research Institute, Kansas City, Mo.

A NEW ANALYTICAL tool for the pipe line engineer that is rapidly becoming recognized in the public utility industry as an invaluable aid to pipe line network computations is the McIlroy pipeline network analyzer. A relatively new device, there being only three units in use as of early this year, it enables flow and pressure distribution analyses to be made on fairly large and complex pipe line networks in total setup and computational times on the order of one-eighth the time usually required by long established numerical trial-and-error methods.

The analyzer, which is a simulator type of analog computer, permits rapid and accurate studies of a wide range of pipe line fluid flow problems. It is suitable for analyses involving compressible and incompressible flows: water, oil, gasoline, steam, air, and gas flow problems are amenable to solution on the analyzer. The primary use of the analyzer during its rather brief span of existence has been with public utility distribution problems. The petroleum industry will find the analyzer helpful in the study of gathering, distribution, and transmission pipe line systems. These studies can prove profitable for existing as well as planned systems.



HUNDREDS OF FLUISTOR tubes having different resistant coeficients are stocked at Midwest Research Institute to speed simulation of pipe line characteristics.

An extremely important advantage of the analyzer, besides enabling a rapid solution of a particular pipe line problem is the facility with which alternate schemes may be evaluated in a process of optimizing a network design. Proposed plans for elimination or addition of pipe lines can be evaluated with comparative ease. A recent analysis of a municipal steam distribution system showed which of several pipe line addition propositions, each involving expenditures on the order of $1 million was the most efficient. More system variations will be tried on the analyzer than if the solution were obtained by numerical methods; thus it is more likely that the best scheme will be found.

General Principles. The analyzer which was developed by Prof. Malcolm S. McIlroy of Cornell University, operates on a direct analogy of analog computers in which a passive electrical circuit simulates a physical system in its operation. In the study of the incompressible flow of such fluids as oil, water, low pressure gas, and atmospheric air the relation between friction head loss, H, and mass flow rate, Q, is usually expressed empirically in the form

$$H = K_p Q^n$$

The exponent, n, is usually assumed to be either 1.85 or 2 depending upon the authority used; K_p is a head loss coefficient which is dependent upon the size and condition of the pipe and the fluid flowing through it.

The non-linear character of the above relationship must be simulated exactly in an electrical network if a direct analogy is to exist. Initially, solutions of pipe line network problems by electrical analogy were handled on calculation boards employing linear resistors to simulate the pipe line friction. In these analyzers, as in the McIlroy unit, electrical current is analogous to fluid flow rate, and voltage to friction head loss. The use of linear resistors, however, requires a successive approximation technique in the solution, and, although it is faster than the numerical trial-and-error approach, does not have the advantage of being a direct analogy method.

A direct analogy requires that the

relationship between voltage and current for a resistor have the following form:

$$V = KI^n$$

where the voltage drop, v, across the resistor bears a proportionality to the *n*th power of the current, I. For the linear network, of course, n is 1; the requirement for a resistor in which n assumes a value suitable for simulating fluid flow friction has been met by the design of a special, non-linear resistor element called the fluistor which has an exponential factor, n = 1.85.

The fluistor forms the basic element of the analyzer. The analyzer shown in Figure 1 which is in use at the Midwest Research Institute provides a means for interconnecting a maximum of 104 of these fluistors in accordance with the particular network being studied. The fluistors are stocked in quantities of several hundred to over a thousand and have coefficient values approximately 5 percent apart. Two fluistors having different resistance coefficients are shown in Figure 2. Each fluistor consists of a single, straight, uncoiled tungsten filament supported by nickel leads in an evacuated glass bulb. The bulb is sealed to a standard screw base, which may be inserted in any of the sockets provided for that purpose in the analyzer.

Thus by connecting fluistors, having coefficient values relating to the friction head loss of the actual pipe lines, in an electrical network having the same configuration as the actual network, a very close electrical model is obtained. Head losses between any two points of the network are read as voltages, and with an ammeter any desired flow is read.

Analyzer Features. The analyzer shown in Figure 1, besides providing a means of interconnecting the fluistors, provides for the connection of the six separate, independently variable sources at any point of the network; thus, the simulation of reservoirs or pumping stations is effected. Similarly there is a provision for attaching at any pipe line junction a load, representing a consumer take-off point. There are 43 separate and independently adjustable load devices on this particular model. The nature of these particular loads is that of a constant current ballast resistor, which draws nearly the same current regardless of changes made in the rest of the network. This minimizes the amount of rebalancing required when fluistors and resultant voltage drops are altered in the network. Newest models of the analyzer incorporate electronic regulation of each of these load currents to a more constant value in addition to greatly increased pipe line handling capacity.

About the Author

PRICE D. WICKERSHAM is an electrical engineer at Midwest Research Institute in Kansas City, Mo. He received his education at the University of Illinois, graduating in 1942. Since that time he has worked in development of servomechanisms, jet engine tachometers, and on many other instrument measurement problems.

Incompressible Flow Analysis. In certain problems, the fluistor current voltage relationship, $V = KI^{1.85}$ is not truly representative of the actual network conditions. It is entirely suitable in all those cases where the Hazen-Williams incompressible fluid flow formula, $H = K_pQ^{1.85}$ is applicable. However, in those cases where the condition of the pipe is known accurately it may be desirable to make allowances for the fact that the pipe line friction coefficient is not constant, but is a slowly varying function of Reynolds Number. Darcy's fluid flow law, which incorporates a variable friction factor, diverges from the Hazen-Williams expression to a certain extent at high flow rates. The process of correcting for this effect, if warranted, is made during the analysis by finding which pipe lines have high flow rates corresponding to a significant divergence from the Hazen-Williams law. The fluistors representing these particular lines are then replaced by elements having coefficients corrected for the high flow rate condition.

For those flow problems where the flow rate exponent is 2 rather than 1.85, the fluistor may still be used over a wide range of flows. If the fluistor coefficients are chosen so that the 1.85 power and square law formulas intersect at pressure drops corresponding to average conditions in the network being studied, the divergence from the exact square law simulation is small.

Compressible Flow Analysis. To handle compressible flows on the analyzer, it is necessary to modify the general relationship

$$P_1 - P_2 = K_fVLQ^n$$

in which P_1 and P_2 are inlet and outlet pressures, respectively; K_f is a friction coefficient; V the specific volume of the fluid; L is the length of the pipe; and Q^n is the ninth power of the mass flow rate. In order to use the fluistor relationship, it is essential to eliminate the specific volume, V, from the right hand side of the equation. This is done by expressing the specific volume as an approximate function of pressure over a certain pressure region, thus;

$$V \cong C/\tfrac{1}{2}\ (P_1^x + P_2^x) \quad Pa \leqslant P_1, 2 \leqslant P_b$$

The expression is a good approximation only in the pressure range bounded by P_a and P_b; the coefficient, C, and the exponent, x, are assumed constant over this region, but are different for other pressure ranges.

The above pressure difference equation, after substitution of the approximate expression for specific volume, becomes:

$$P_1^{(1+x)} - P_2^{(1+x)} = 2K_fCLQ^n$$
$$P_a \leqslant P_{1'2} \leqslant P^b$$

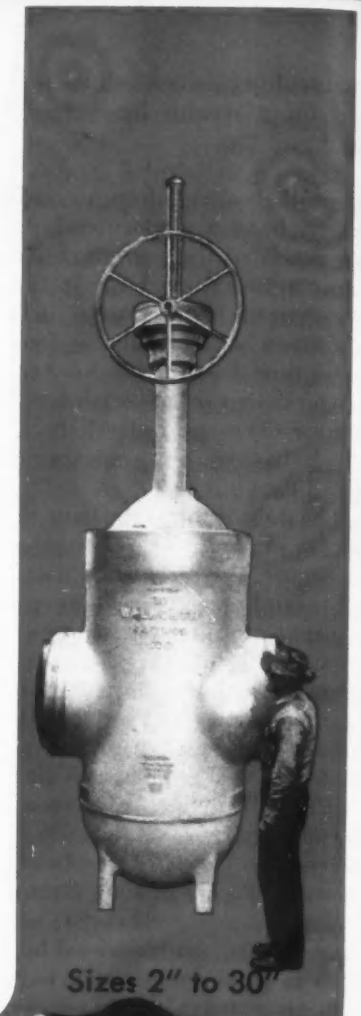
This equation is suitable for handling on the analyzer with the same analogies applying as before except that measured voltage drops are now directly related to the difference of $(1 + x)$ powers of pressure. The actual pressures existing at points of a network are desired rather than this difference function. They are determined by starting at a known pressure point in the system, such as a source; and by using the measured pressure difference functions for each pipe line segment in reference pressure are determined. This procedure is more lengthy than with the incompressible flow analysis, but is greatly facilitated by the use of nomographs.

This device has assisted Midwest Research Institute engineers to solve difficult computational problems in more than a hundred cases where the time element was of vital importance.

—**The End.**

2 Headline Attractions in PIPELINE CONSTRUCTION

The new Type 49 WALWORTH Gate Valve



Sizes 2" to 30"

★ Through-port design; body and disc ports accurately indexed and the body ports bored to match the pipe.

★ No recesses, no obstructions.

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★ Walworth boltless design body-to-bonnet joint.

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★ Incorporates 111 years of Walworth experience in the manufacture of bronze, iron, and steel valves.

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Rules of Thumb

FOR THE PIPELINER'S NOTEBOOK

Engineering Design —9—A practical way to calculate gas flow for pipe lines.

Here is a short cut way to calculate gas flow in pipe lines. It is based on the Panhandle formula. At 60° F. and specific gravity of 0.60, the answer will be accurate. For every 10 degrees variation in temperature, the answer will be 1 percent in error. For every 0.01 variation in specific gravity, the answer will be three-fourths percent in error.

Formula:

$$Q = \frac{(871)\ (d^{8/3})\ \sqrt{P_1^2 - P_2^2}}{\sqrt{L}}$$

$Q =$ cubic feet of gas per 24 hours. 871 is a constant.

$d =$ pipe I.D. in inches.

$P_1 =$ psi (absolute) at starting point.

$P_2 =$ psi (absolute) at ending point.

$L =$ length of line in miles.

Example: How much gas would flow through one mile of six-inch I.D. pipe if the pressure at the starting point is 485 psi and if the pressure at the downstream terminus is 285 psi?

Answer:

$$Q = \frac{(871)\ (6^{8/3})\ \sqrt{(485+15)^2 - (285+15)^2}}{\sqrt{1}}$$

$$= \frac{(871)\ (120)\ \sqrt{500^2 - 300^2}}{1}$$

$$= (871)\ (120)\ (400)$$

$$= 41{,}800{,}000 \text{ cu. ft. per 24 hours.}$$

Example: What would be the flow through four miles of 10¾-inch quarter-inch wall pipe using the same pressures?

$$Q = \frac{(871)\ (10.25^{8/3})\ \sqrt{500^2 - 300^2}}{\sqrt{4}}$$

$$Q = \frac{(871)\ (495.7)\ (400)}{2}$$

$$Q = 86{,}350{,}000 \text{ cu. ft. per day.}$$

This is the twelfth month that WORLD OIL has carried Rules of Thumb which are shortcuts that yield reasonably accurate answers for design, maintenance calculations. Below is an index of the Rules of Thumb carried thus far. If you have a Rule of Thumb, share it with others by sending it to Donald M. Taylor, Pipe Line Editor, WORLD OIL, P. O. Box 2608, Houston 1, Texas.

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Pipe Line Men

IN THE NEWS

Hagerman and Wile Retire From Columbia Gas System

After 16 years as an officer of Columbia Gas System companies, Oliver S.Hagerman retired as chairman of the boards of United Fuel Gas Company and six other Charleston group firms. He will remain as a member of the boards for the companies, which include Amere Gas Utilities Company, Atlantic Seaboard Corporation, Big Marsh Oil Company, Central Kentucky Natural Gas Company, Virginia Gas Distribution Corporation, and Virginia Gas Transmission Corporation.

After 40 years of service with the Pittsburgh group companies of the Columbia Gas System, Frank Wile, superintendent of production and transmission division two, has retired. Former assistant division superintendent Thomas E. Ridge, Jr. succeeds him. Appointment of Walter A. Perrin as superintendent of leases also has been announced.

McElvenny Succeeds Fink As American Natural Head

Henry Fink has retired as president of American Natural Gas Company and Ralph T. McElvenny has been elected as his successor. Fink, who has been president and a director of American Natural since 1948, will continue to serve in his present positions with the company's subsidiaries. He is president of Michigan Wisconsin Pipe Line Company, American Louisiana Pipe Line Company and American Natural Gas Service Company and chairman of the board of Michigan Consolidated Gas Company. He will remain a director of American Natural. Fink will supervise the construction of a $120 million pipe line by the new American Louisiana Pipe Line Company.

McElvenny joined American Natural in 1945 and has served as executive vice president since 1951. He is a director of American Natural and its subsidiary, Milwaukee Gas Light Company, and a vice president and director of Michigan Consolidated, Michigan Wisconsin, American Louisiana and American Natural Gas Service Company.

J. L. Shakely Is President Of New Pipe Line Company

J. L. Shakely of Tulsa, who retired the first of this year as president of the Jones & Laughlin Supply Company, is president of the recently organized Oklahoma - Mississippi River Products Line, Inc. J. R. (Dick) Ellis, formerly manager of Sunray's pipe line department, is vice president and general manager.

J. L. Shakely

Directors of the new company are in addition to Shakely and Ellis, Paul E. Taliaferro, H. O. Harder, and L. W. Bennett, officers of Sunray Oil Corporation; Lloyd Gilmour, senior partner in the investment firms of Eastman, Dillon and Company, and William G. McKnight, Jr., also of New York.

Service Pipe Line Shifts Personnel To New District

J. J. Dougherty is district superintendent of Service Pipe Line Company's new west central Texas district in Mineral Wells, Texas. Dougherty, transferred from the company's discontinued Tomball District will have 600 miles of trunk lines and three pumping stations at Mexia, Graford and Ranger under his supervision.

A staff of four will assist him. James R. Bird, transferred from Tomball with Dougherty, is a district clerk. Hal McClintock, division manager, and Paul T. Taylor, division lineman, have made their homes in Mineral Wells for several months. Marguerite Williams, junior clerk, will move to Mineral Wells from Fort Worth.

Magnolia Pipe Line Company Makes Transfers, Promotions

R. W. Stewart has been transferred from Magnolia Pipe Line Company's Luling district as district superintendent, to the Midland district. H. M. Van Buskirk has been transferred from the Midland district to district superintendent of the Luling district.

L. A. Foy has been promoted to chief gauger of the western pipe line division with headquarters at Midland, Texas. John R. Dean has been named chief gauger of the company's north Texas and Olden districts with headquarters at Wichita Falls, Texas. Arnold Balke has been transferred to Midland where he will be gauger foreman in the Pegasus area. K. B. Snider has been named gauger foreman in the Premont area of the Alice district.

Texas Pipe Line Company Ups Kershner and Albitz

S. G. Kershner, vice president of The Texas Pipe Line Company, was promoted to vice president and general manager to succeed the late J. T. Rynd. C. H. Albitz was elected vice president and a director. W. C. Montgomery, who was division manager, oil traffic division, was promoted to succeed Albitz as assistant general manager of the company. Fred Ashford, Jr. was elevated from assistant division manager to division manager, replacing Montgomery.

William J. Grove Appointed Assistant General Counsel

William J. Grove, of Camp Hill, Penn., has assumed new duties with the F. P. C. as assistant general counsel in charge of natural gas matters. Grove succeeds Bernard A. Foster, Jr., who resigned.

Grove is assistant chief counsel of the Pennsylvania Public Utility Commission.

Grove holds a BA degree from Ursinus College and an LLB from Temple University.

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COATING AND WRAPPING MACHINE at work on Buckeye Pipe Line Company's Eastern products system near Montrose, Pa.

Buckeye System Designed For Easy Expansion

Much of the equipment and many parts can be interchanged and capacity increased at minimum cost.

By DONALD R. MERRIMAN, Division Engineer,
The Buckeye Pipe Line Company, Macungie, Pa.

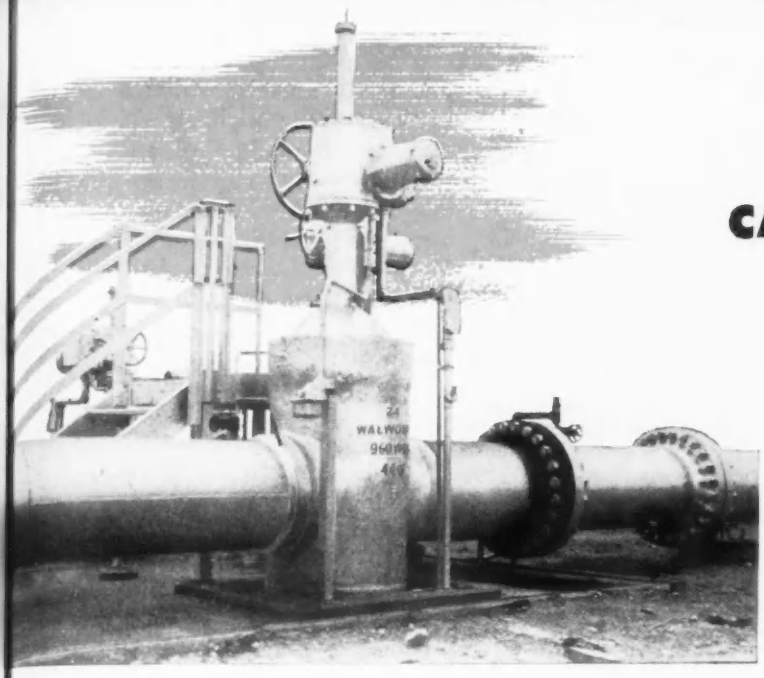
THE BASIC DESIGN of The Buckeye Pipe Line Company's new $24 million Eastern Products System, extending 368 miles from Linden, N. J., to Syracuse and Caledonia, N. Y., provides that future demands for petroleum transportation can be met in the area it serves by orderly planned expansion with minimum capital outlays.

In planning a common-carrier products pipe line to serve the thickly populated and highly industrialized areas of Eastern Pennsylvania and Western New York, Buckeye believes that with the installation of a 16-inch line from Linden to Macungie, Pa., a 14-inch line from Macungie to Auburn, N. Y., and two 10-inch lines, one to Syracuse and one to Caledonia, would with proper allowance for additional booster pumping capacity provide the necessary transportation facility for meeting the expected growing demand in the areas served.

Present capacity of the 16-inch line is 106,000 barrels daily of gasoline with an ultimate capacity of 188,000 barrels per day. The 14-inch between Macungie and Nicholson has a capacity of 92,400 barrels and between Nicholson and Auburn stations the capacity is 80,300 barrels daily. Ultimate capacity of the entire 14-inch line for gasoline is 102,700 barrels daily.

The 10-inch line between Auburn and Syracuse has a daily capacity of 86,400 barrels daily, limited initially to 80,300 barrels per day because of the present capacity of the 14-inch line. The Auburn-Caledonia 10-inch line has a capacity of 48,000 barrels daily which eventually can be boosted to 72,000 barrels.

Two-Year Job. Because of government materials allocations construction of the Eastern Products System was spread over two years. The Linden-Macungie line was completed in 1952 and the remainder was finished in 1953. The completed system was dedicated October 22. Despite delays due to weather, late arrival of critical material, and other causes, the

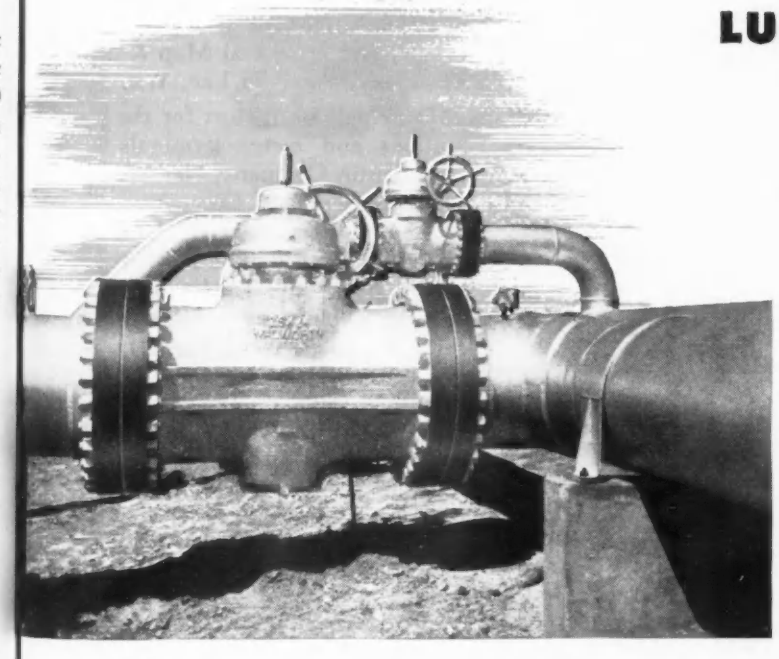


CAST STEEL GATE VALVES

A 24-inch Walworth Type 49 Series 400, 960 WOG, Cast Steel Gate Valve with welding ends and motor operating device, on a pipeline handling crude petroleum.

Walworth Type 49 Valves are especially designed for service on pipelines handling gas, refined products, or crude oil. Through-port construction allows free passage of pigs and scrapers. These valves do not require any internal lubrication and may be installed without regard to direction of flow.

WALWORTH makes both for pipeline service



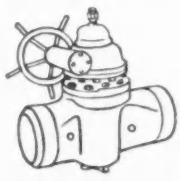
LUBRICATED PLUG VALVES

A Walworth 26 x 24-inch, 1000 WOG Cast Steel, Worm Gear Operated, Flanged, Lubricated Plug Valve installed on main line discharge of a gas pipeline.

Walworth Lubricated Plug Valves afford quick, easy operation . . . a quarter turn gives full, direct port opening. The lapped surfaces of the plug and body, plus the seal afforded by the lubricant, assure a tight, leakproof valve.

Always use Walworth lubricants in Walworth Lubricated Plug Valves.

Let us help you with your pipeline valve problems. Because we make *both* gate valves *and* lubricated plug valves, we can give you an unbiased recommendation regarding the best type of pipeline valve for your particular need. See your nearest Walworth distributor, local Walworth representative or write: ***Walworth Company, General Offices, 60 East 42nd Street, New York 17, N. Y.***



Walworth Lubricated Plug Valves for Pipeline Service

Made of cast steel. Sizes up to 30 inches. Working pressures up to 5000 psi.

Walworth Type 49 Cast Steel Pipeline Gate Valves

Sizes 2 to 30 inches, inclusive. Series 400 and 600 for working pressures up to 1440 psi.

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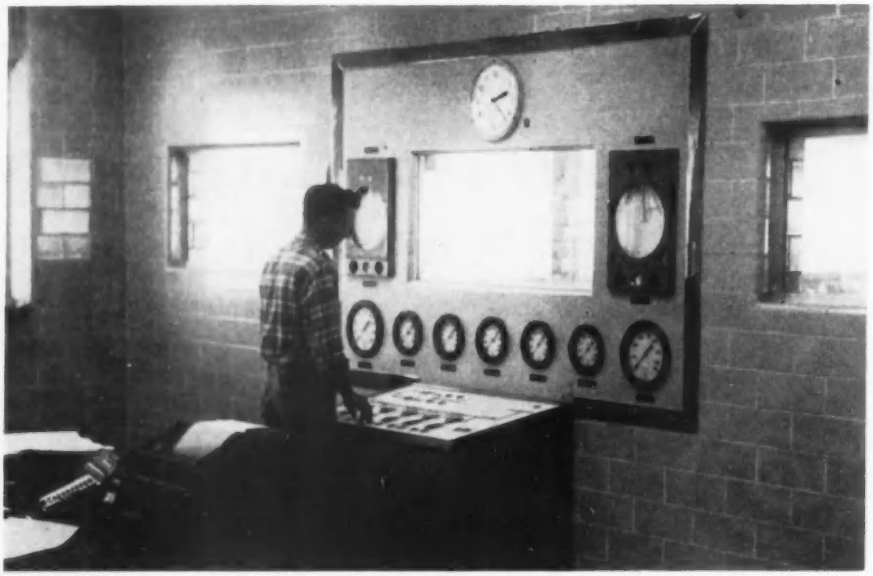
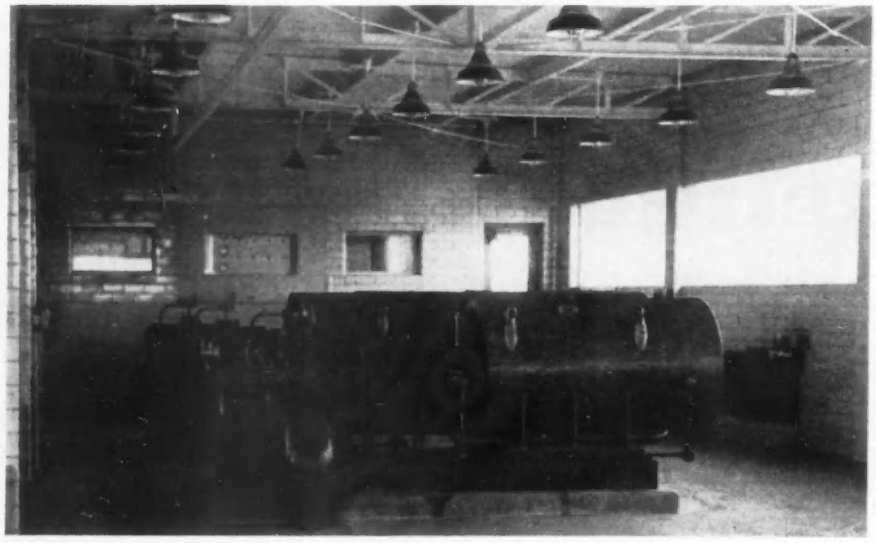


MAIN STATION CONTROL CONSOLE at Linden pump station of Eastern Products system. Table top is starting sequence panel. Beyond tile and glass-windowed wall is pump motor room.



PUMP ROOM at Linden station has three 800-HP explosion-proof induction motors driving single stage centrifugal pumps. Linden station was designed for addition of two more pumping units and at maximum capacity, four units will be operating with one as spare.

MAIN STATION MANIFOLD at the Linden station of Eastern Products system.

line was completed within a month of the schedule originally set.

Eastern Products System will serve 13 shippers with movements into the line from refineries and deep water terminals near Linden and from the Harbor Pipe Line from the Philadelphia area. Tenders handled will be those from American Oil Company, California Oil Company, Cities Service Oil Company, Crown Central Petroleum Corporation, Esso Standard Oil Company, G.L.F. Farm Supplies, Gulf Oil Corporation, Hartol Petroleum Corporation, Shell Oil Company, Sinclair Refining Company, Southern Oil Company, The Texas Company, and Tidewater Associated Oil Company.

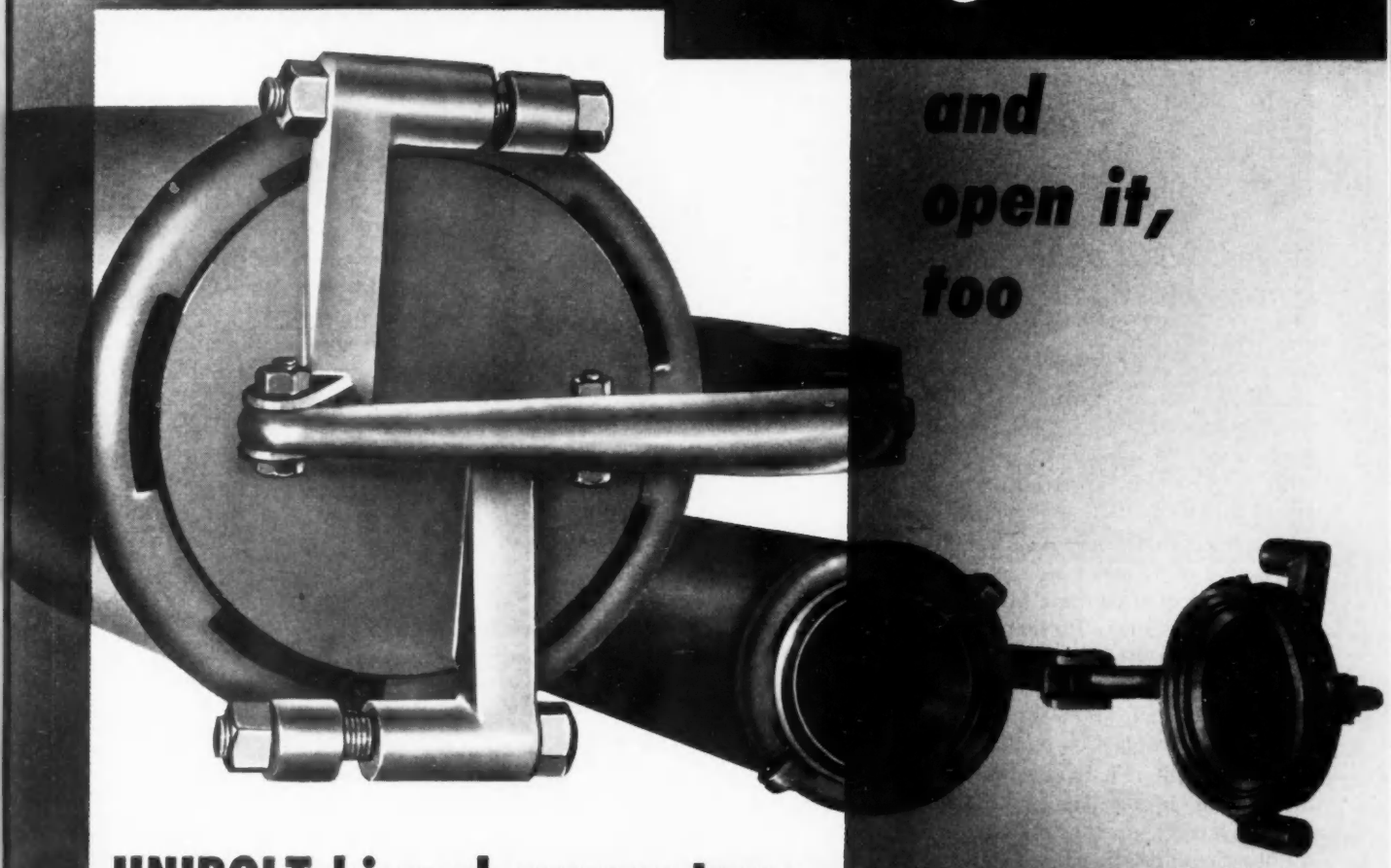
The line was designed by Pipe Line Engineering Company, Dallas, together with the staff of The Buckeye Pipe Line. Principal contractors for the line construction were: Bills Construction Company, Tulsa; Folk Construction Company, Morrisville, Pa.; Fulghum Construction Company, Harrisburg; H. L. Gentry Construction Company, Jackson, Mich.; Merritt-Chapman & Scott Corporation, New York; Pipe Line Construction & Drilling Company, Camp Hill, Pa.; Williams-Austin Company, Pittsburgh; and Universal Map & Survey Company, Fond du Lac, Wis.

Principal contractors for the pump stations and meter terminals were: The Austin Company, New York; H. N. Crowder, Jr., Company, Allentown; General Electric Service Company, Harrisburg; The Harnett Company, Syracuse; J. J. Harrington, Auburn; Matthews Installation, Inc., New York; A. Neri, Inc., Hoboken, N. J.; Rowland Tompkins & Sons, Inc., New York; and H. J. Williams Company, Inc., West York, Pa.

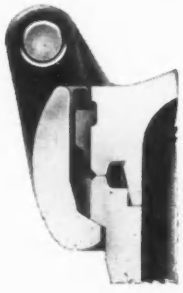
Right-of-Way Problem. One of the most difficult problems was the acquisition of right-of-way.

Unlike the more open parts of the country in the Mid-West, Southwest and West Coast where survey lines are nearly north-south and east-west, Buckeye was faced with the problem of obtaining right-of-way easements through numerous small properties of varying sizes and shapes. Many of the original surveys on these properties were found to be in error which made it necessary to survey many separate parcels before a right-of-way grant could be obtained. Before their job

the best way to Shut Your Trap and open it, too



UNIBOLT hinged scraper traps with self-sealing gasket



The self-sealing gasket is shown in cross-section at left. Note the lipped design of the gasket which makes it self-sealing under line pressure.

Just release two bolts and the Unibolt Hinged Scraper Trap swings open like a door. Close it and tighten two bolts. That's how simple and easy it is to operate. There's nothing to drop, no threads to leak, gall, or freeze, no multi-bolt flanges. The Unibolt design places a large area of metal in shear, consequently it is stronger and safer — no danger of failure under line surges or vibration.

Pipeliners everywhere are using Unibolt closures and couplings for scraper traps, blowdowns, strainers, mist removers, and other large diameter pressure vessels. Bulletin PL-510 presents the details on all Unibolt Pipeline Products. A copy will be sent gladly on request.

THORNHILL CRAVER CO.

P. O. BOX 1184 HOUSTON, TEXAS

SUCTION BOOSTER. Here are two 200-HP station suction boosters at the Linden station. Left foreground is outgoing mainline scraper trap. Filters are in background.

was finished, right-of-way agents contacted 2517 persons owning 1742 separate parcels of land. In addition permits were obtained for the line to cross 504 roads, 58 railroads, 11 rivers, and 9 canals.

Construction of the line required the laying of 45,000 tons of pipe and the erection of three tank farms using 6830 tons of steel. Present tankage provided is for 1,677,000 barrels with provision made for an ultimate tank farm capacity of 3,904,000 barrels.

Eastern Products System has five pumping stations with total power of more than 11,000 HP. To a large extent station operations are semi-automatic, controlled by pushbuttons from a central control desk. Station pressures, flow rate and oil heights in tanks may be observed at this point. Safety devices have been provided to sound alarms, and if necessary, automatically shut down any operations at the stations in case of emergency.

Linden Station has three centrifugal pumps driven by 800-horsepower electric motors. Provision has been made for two additional units. Also two 200-horsepower vertical turbine pumps provide suction pressure for the main units. Macungie Station is equipped with three 800-HP electric-centrifugal units with provision for one future unit. Two 150-HP vertical turbine pumps are used as station suction boosters.

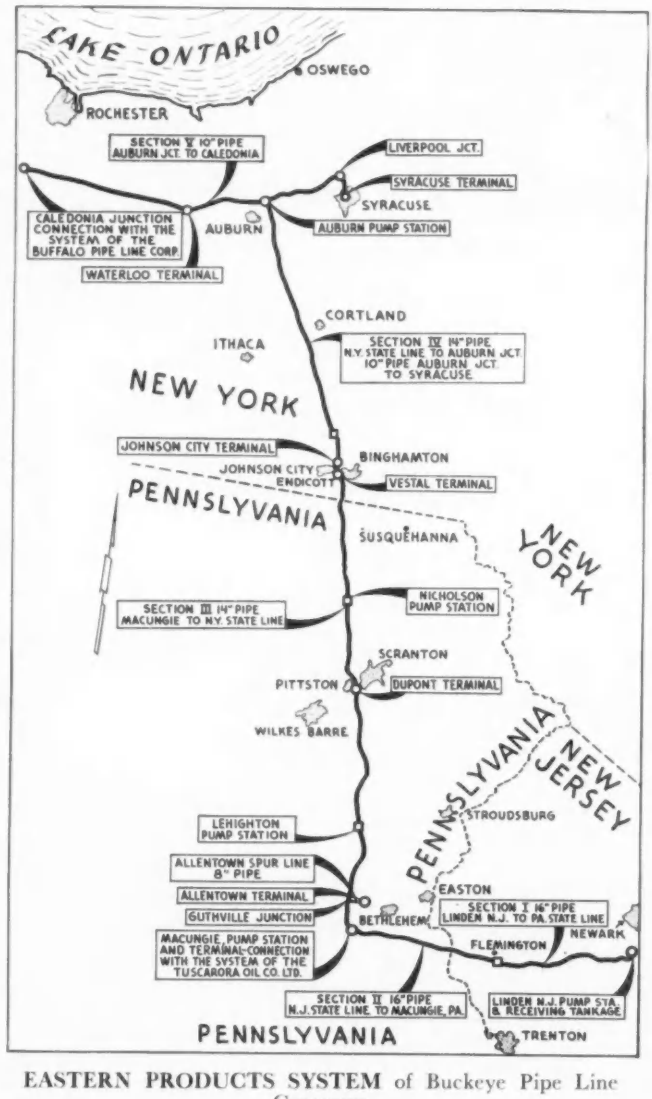
Lehighton Station has three and Nicholson Station two 700-HP electric-driven centrifugal pumps. Provision for one addition unit at Nicholson has been made. Auburn Station is equipped with five piston-type pumps powered by 215-HP diesel engines. Future plans call for the erection of an electric-centrifugal plant at Auburn. In addition to the main pumping units each of the 31 tanks on the system has a vertical turbine suction pump. All tankage on the system has been equipped with sump bottoms for complete emptying.

Expansion Considered. Linden Station, in keeping with the others of the system, was designed to provide future expansion with minimum disruption of existing facilities and at minimum cost. Also, as far as possible, material and equipment were standardized to provide maximum interchangeability of parts. For instance, in the tank farm, a standard 50-HP vertical turbine tank booster pump was selected for all tanks and the tank lines to the main manifold were sized to provide the same pressure drop regardless of the distance the tank was from the manifold. Naturally in the main manifold all valves are interchangeable. From the manifold two 200-HP station booster pumps have been provided to move the product through the filter tanks and meter bank and give positive suction on the main units.

In the main station the electrical control consoles are of the standard size with circuit breaker and switchgear units as interchangeable as their size will permit.

The manifold has provision for additional tank lines and valving without disrupting the present manifold. Additional land has been purchased for the installation of future tankage. The choice of masonry building material for this station was based on ease and low cost of maintenance.

Insofar as practicable, the opera-



EASTERN PRODUCTS SYSTEM of Buckeye Pipe Line Company.

About the Author

DONALD R. MERRIMAN joined The Buckeye Pipe Line Company shortly after graduating from Massachusetts Institute of Technology with a B.S. degree in June 1949. Merriman has been in the engineering department of the company, closely associated with Buckeye's recent expansion and modernization programs. He has worked on the Eastern Products System from its inception, and shortly before opening of the new carrier was named division engineer of the system with headquarters at Macungie, Pa.

tion of the station, that is starting and stopping the main units and changing tanks, has been automatically sequenced to provide reliable and high speed tank switching even when the station is operating at maximum rate. Automatic remote liquid level gauges have been provided for all tanks with high and low level alarms and shutdown protective features.

The main flow of oil through the station through the station booster pumps through the main pumps and into the line has been protected with low suction and high and low discharge alarm and shutdown devices as well as pump case pressure, motor and pump bearing temperature, motor and winding temperature and pump seal failure indicators. As an added protection, exhaust fans maintain a differential pressure between the pump room and the control and switchgear rooms so that no hazardous vapors can be drawn into the control room.

The electrical control room containing the switchgear control cubicles has been made a limited access room and is protected by an automatic CO_2 fire extinguisher system. All gas-type tanks have been provided with foam connections and the station is equipped with a fire and foam truck. An emergency lighting and power generator as well as a fire pump have been housed in a separate building at Linden Station.—**The End**

Threads 4 sizes of pipe *fast* with 1 set of dies—*and it won't jam!*

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65R PIPE THREADER

This popular 65R has saved millions of hours of threading time, and no wonder—its one set of self-contained high-speed dies adjust to 1", 1¼", 1½" or 2" pipe size in 10 seconds! Mistake-proof self-centering workholder sets instantly! And lead screw won't jam on workholder, kicks out automatically at standard thread length! You can't match it for fast easy pipe threading —buy it at your Supply House.

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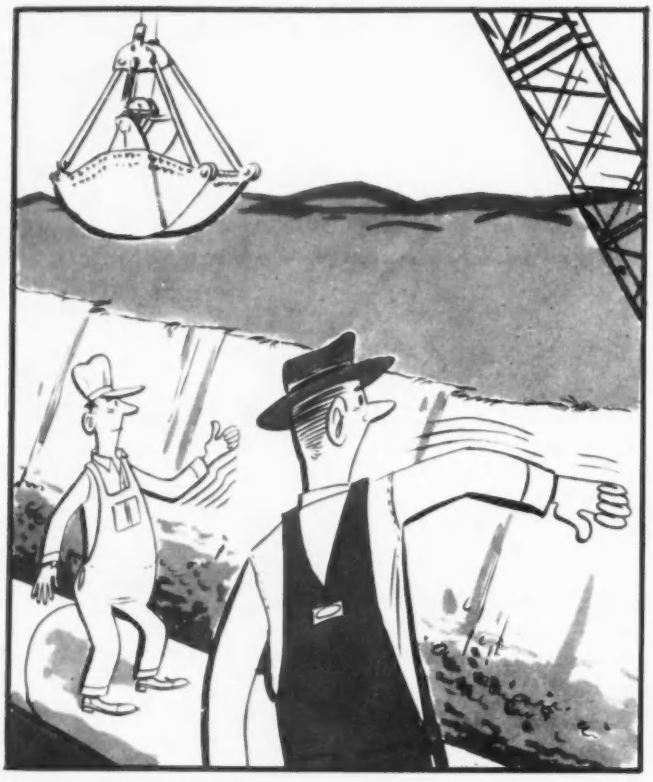
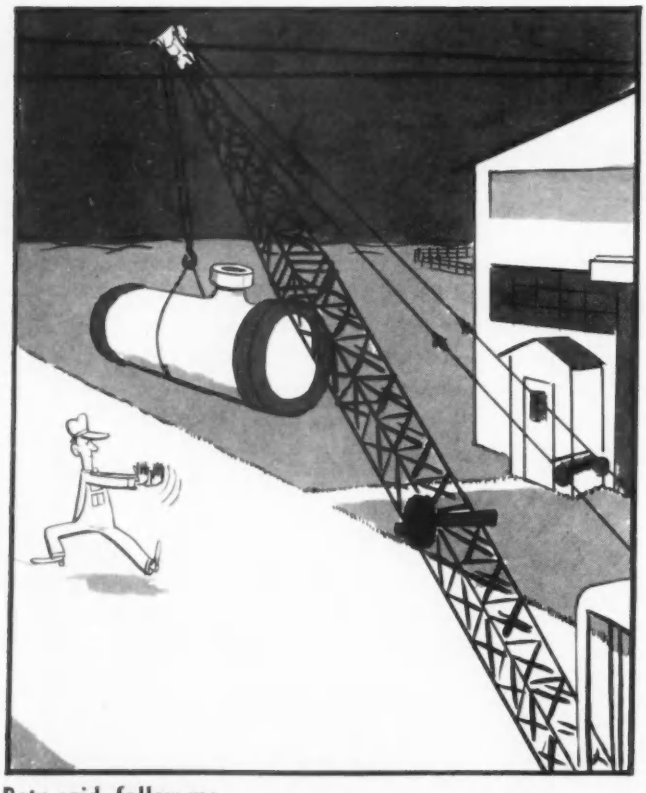
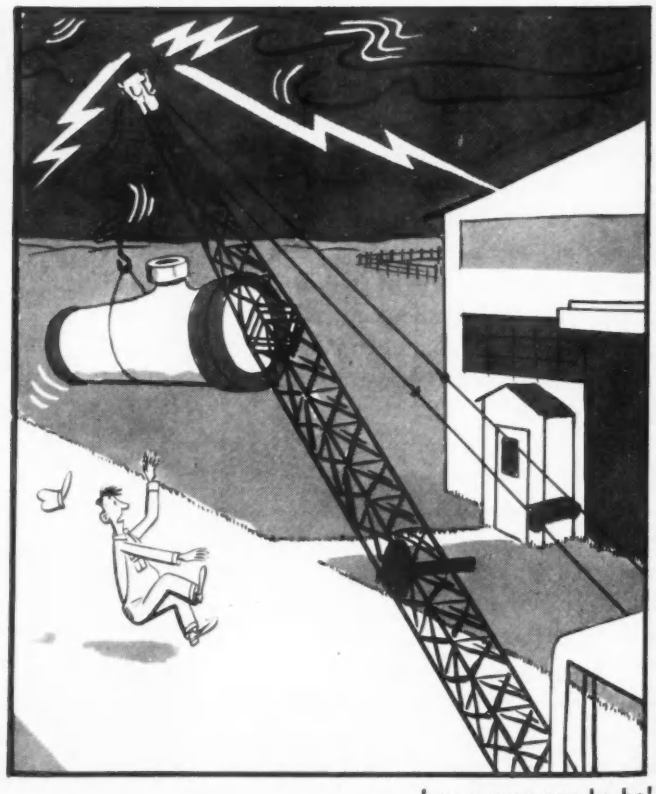


One says up, one says down . . .

. . . now Pete won't be around



Pete said, follow me . . .



. . . how wrong can he be!

WHAT'S HAPPENING
IN PIPE LINE CONSTRUCTION

By **THERESA K. MARTIN,** WORLD OIL Staff

CONSTRUCTION SCENES on Gulf Interstate line. Above left is H. C. Price Company pipe gang in Kentucky. Above right is Green River Crossing. Below left, Casey Creek crossing. Below right, line goes under State Highway 82.

Gulf Interstate Moving Along

Construction on Gulf Interstate Gas Company's line is moving ahead much faster than was scheduled. Already, more than 215 miles of the 30-inch natural gas line from Acadia Parish, La. to Boyd Co., Ky. has been completed.

In addition, construction has been started on the major river crossings, the Mississippi, Tennessee, Cumberland, Kentucky, Red and Ouachita. The Mississippi River crossing has reached the point where crews have begun laying the 24-inch concrete-coated first line on the bottom of the river.

H. C. Price Company and Houston Contracting Company are rushing work to complete as much of the big line as possible before bad weather sets in.

The 860-mile line is scheduled to go into service late in 1954.

Salt Lake Pipe Line Company Completes Spokane Line

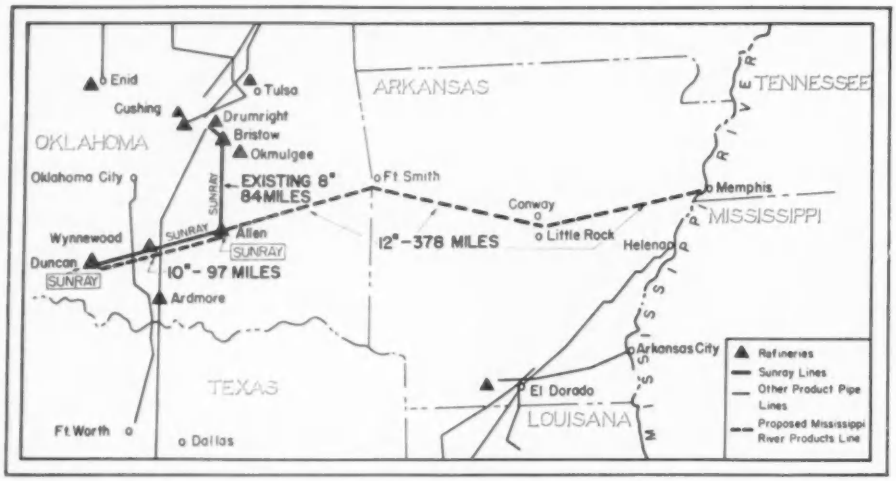
A $4 million petroleum products pipe line from Pasco, Wash., to Spokane has been completed. The line, constructed and to be operated by Salt Lake Pipe Line Company, common-carrier subsidiary of the Standard Oil Company of California, is 140 miles in length, eight inches in diameter, and will have at hrough-put capacity of 15,000 barrels a day. Principal products to be carried are gasolines, heating oils and diesel fuels.

Awarding of Contracts Gets Yellowstone Line Underway

Contracts for the $20.5 million, 537-mile Yellowstone products pipe line have been awarded to four contractors. Ross & Powers Construction Company, Billings, Mont., will build the section from Billings to Bozeman, Mont.; Associated Pipe Line Contractors, Houston, Texas, two sections, Bozeman to Helena and Helena to Clinton, Mont.; Eastern Pipeline Contractors, Dallas, Texas, two sections, Clinton to Perma, Mont., and Perma to Murray, Ida.; Engineers Ltd. Pipeline Company, Denver, Colo., Murray to Spokane.

Continental Pipe Line Company will direct construction of the line and will manage its operations through the staff of the newly formed Yellowstone Pipe Line Company. Continental Oil Company and Interstate Oil Pipe Line Company, an affiliate of Standard Oil Company (New Jersey), each own a 40 percent interest in the Yellowstone line. Union Oil Company of California has a 14 percent interest and the H. Earl Clack interests of Havre, Mont., and Spokane have a six percent interest.

The 10-inch line, scheduled for completion by September 1, 1954, will have an initial daily capacity of 30,000 barrels of gasoline, fuel oil and other petroleum products.



475-Mile Products Line Planned

A 475-mile long petroleum products pipe line is to be constructed from Sunray Village (Duncan), Okla. to a point on the Mississippi River at West Memphis, Ark. Sunray Oil Corporation will own 50 percent of the stock in the Oklahoma-Mississippi River Products Line, Inc., organized to build and operate the project.

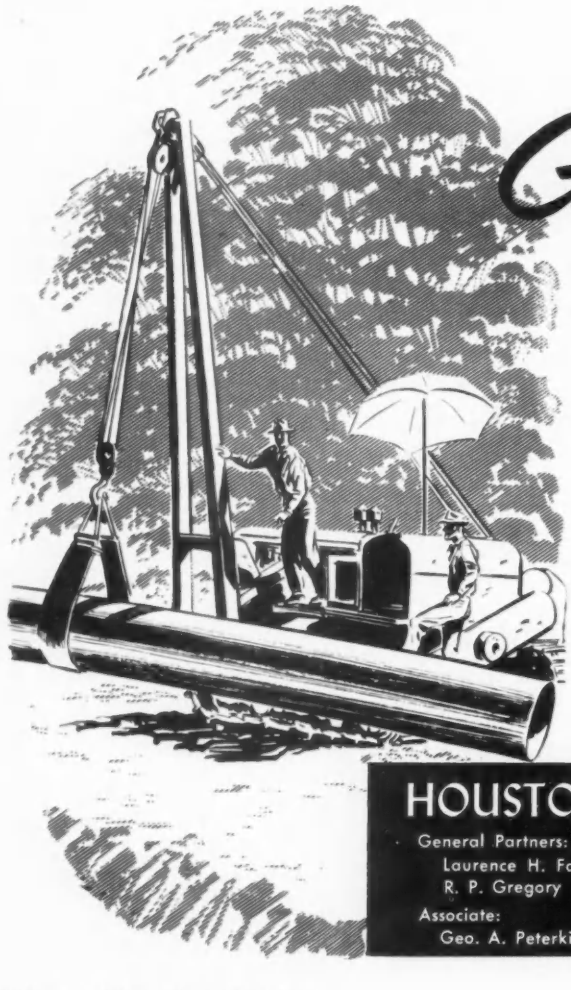
Initial capacity of the 10- and 12-inch line will be 35,000 barrels per day. Terminal facilities will be at Fort Smith, Conway, and West Memphis, Ark. In addition to Sunray Oil Corporation, which will put its products in the line from its refineries at Allen and Duncan, Okla., facilities of the system will be available to other refiners who have plants in the central Oklahoma area. An 84-mile products line Sunray now operates between Allen and Drumright, Okla., will also become part of the new system and Drumright, Bristow and Wynnewood will be station exchange points.

River Construction Corporation, Fort Worth, has contract for construction of 400 miles of the line starting at Duncan. Williams Brothers Corporation, Tulsa, has contract for construction of the remaining 75 miles of the line, ending at West Memphis.

Estimated cost of the new system is between $20 and $25 million.

PAD Proposes Construction Of Texas-Atlantic Crude Line

The petroleum administration for defense proposes to ask the oil industry for proposals on the building and financing of a 36-inch oil pipe line from Texas to the Northeast. It would be a defense project. The suggested line would have two forks—one from the West Texas fields and one from the Middle West. They would be joined and run to the New York area.



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How SUNRAY OIL boosts pipe line capacity 25%

Three years ago production skyrocketed at the Sunray Oil Corporation refineries in Duncan and Allen, Okla. Expansion throughout the system overloaded the 6-inch pipe line between the two cities. Bigger pipe was not available.

Sunray engineers hit on a cost-cutting solution—installed three electrically powered booster stations between regular pumping stations. They know that electric motors cost less to install . . . require little maintenance . . . are easily adapted to remote control circuits.

Then engineers selected an RCA 960-mc Microwave radio-relay system to effect complete remote control of the *"boosters"* from regular pumping stations. Microwave stations spaced miles apart proved cheaper to install and maintain than direct wire. And Microwave systems are virtually weatherproof.

When the Sunray microwave-operated *"boosters"* were put in operation on January 31, 1952, *the pipe line's capacity immediately increased 25 per cent!*

RCA Microwave "beams" highly directional radio signals from station to station by "dish" antennas. Since 1946 RCA has installed many fully reliable Microwave systems, some over 1,000 miles long. *All have proved themselves in performance*—for utilities, government agencies, telegraph companies, turnpikes, as well as pipe lines.

In addition to remote control and supervisory functions, RCA Microwave provides as many voice and teletype channels as you need—and does it with a minimum of frequency space. It employs readily available tubes and familiar circuits which are easy to service. It interconnects with your telephone lines and switchboards.

If you desire, RCA supervises survey, construction and installation—offers a complete single-source, single-responsibility service. And only RCA can provide the nationwide service facilities of the RCA Service Company.

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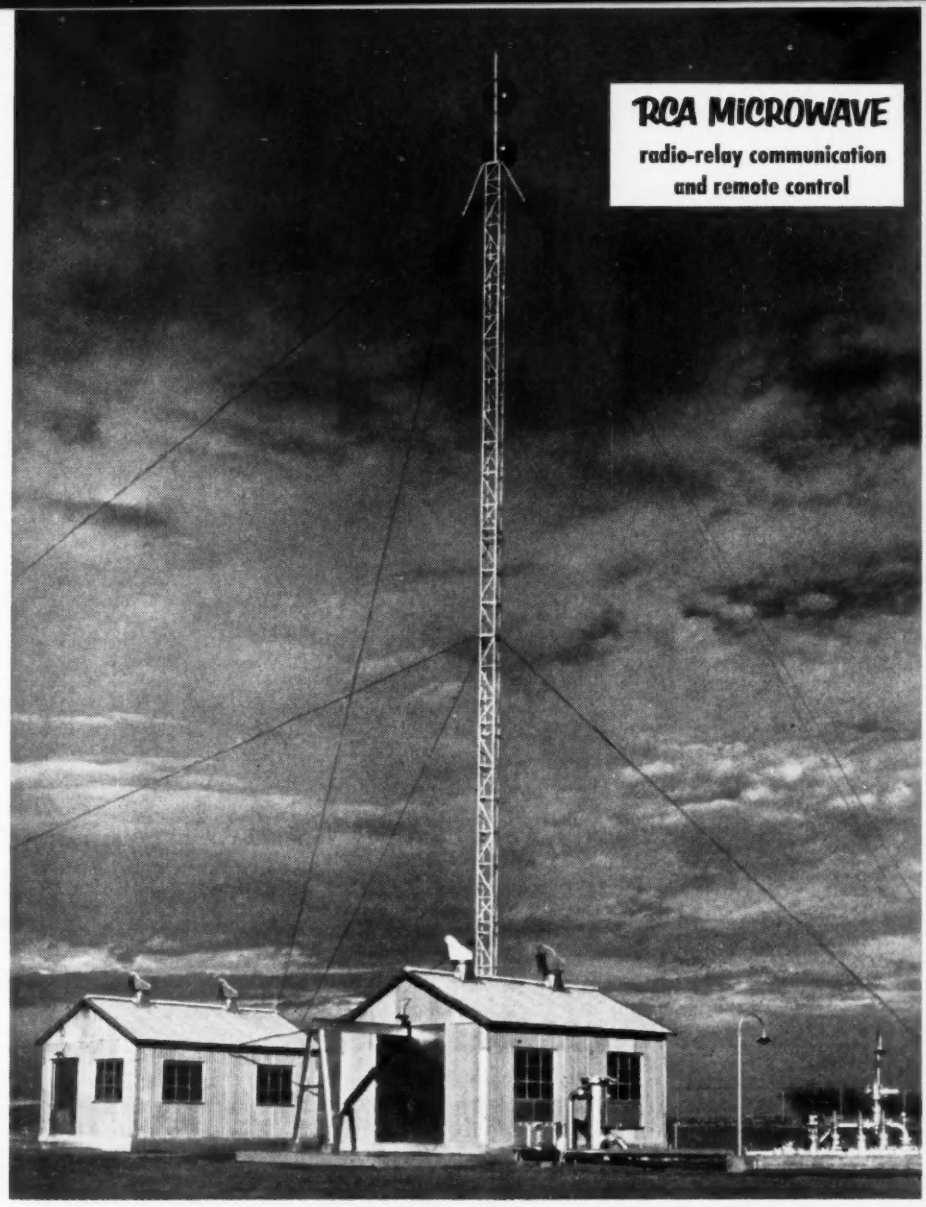
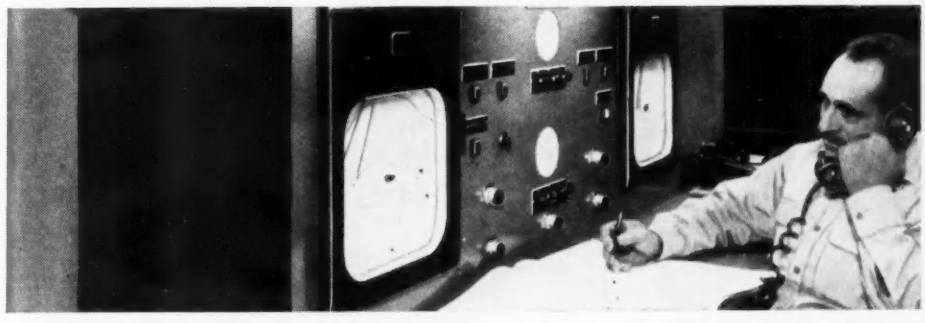


Unattended booster station at Pernell, Okla. Radio-beam signals via RCA Microwave operate the booster by full remote control. Maintenance man inspects each station once every 24 hours.



Telemeter charts give continuous record of power and pressures at boosters. Operator remote-controls valves and pumps of booster stations. Signal lights indicate equipment failure and emergency generator operation. 2-way voice channel contacts maintenance personnel.

RADIO CORPORATION of AMERICA
COMMUNICATIONS EQUIPMENT — CAMDEN, N. J.

Dept. 232W, Building 15-1
Without obligation on my part, please send me your free booklet on:

☐ A Booster Station Microwave System ☐ Pushbutton Operation of Boosters

Name_____ Title_____ Company_____

Address_____ City_____ Zone____ State_____

☐ Have an RCA representative get in touch with me.

Gulf Refining Plans Extension Of Pipe Line in New Mexico

J. H. Russell, vice president of Gulf Refining Company, has announced that the company commenced surveys September 8 on a crude oil pipe line extension in the state of New Mexico.

This new construction is to be a 23.4 mile northward extension of a ten-inch crude line from the present point of origin of Gulf's pipe line at Lea Station in Lea County, N. M.; and will branch in a "Y" at the northern end of the 10-inch extension into two eight-inch lines, one of which will extend 23 miles westerly to the Anderson Ranch field and the other to extend 16.9 miles northeasterly to the Denton field.

It is expected that the line will be completed and in service by January 1, 1954.

Central Illinois Company Wants Gas From Trunkline

Central Illinois Public Service Company, of Springfield, Ill., has petitioned the FPC to issue an order directing Trunkline Gas Company, of Houston, Texas, to establish a connection of its transmission facilities with Central Illinois' existing 4-inch Mattoon-Effingham line at a point of intersection near Neoga, Ill. Hearings are currently being held on the petition which also requested that Trunkline deliver and sell natural gas to Central Illinois.

Tide Water Associated Lays Submarine Pipe Line

The Tide Water Associated Oil Company is laying an 18-inch submarine line off the Pacific Coast at Ventura, Calif., to take crude from its Ventura field for off-shore loading of its company tankers.

The line will go out 4300 feet into the Pacific Ocean and terminate in 42 feet of water. The hose at the end will be raised to load tankers and will then be returned to the ocean floor when loadings are completed. The pipe line will be capable of loading at the rate of nine to ten thousand barrels an hour.

Weighing 200 pounds per foot, the line is being given a mastic coating three-quarters of a inch thick to protect and insulate it from corrosion and erosion. An outer coating of one-inch concrete will give the line weight to keep it submerged.

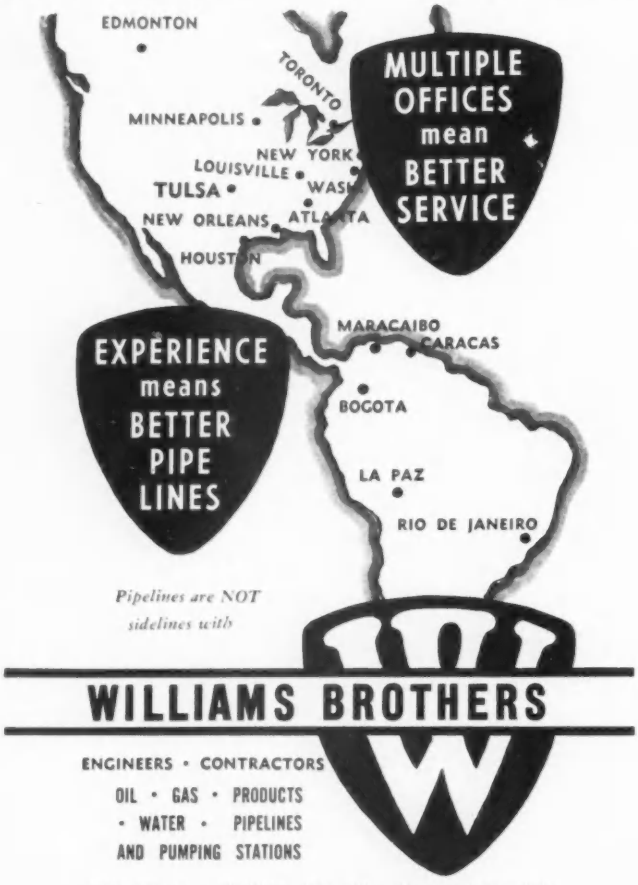
Badger Pipe Line Company Will Build Products Line

Construction of a $15 million petroleum products pipe line system from Chicago to Madison, Wis., will be started in the spring by Badger Pipe Line Company. The 215-mile system, which will give Wisconsin its first petroleum products pipe line, will be built and operated by Cities Service Pipe Line Company. It will be owned jointly by Cities Service Oil Company, Sinclair Pipe Line Company, The Pure Oil Company, and The Texas Company.

The line, scheduled to be put into operation late in 1954, will originate in the East Chicago, Ind., area and will serve metropolitan Chicago, Rockford, Ill., and Madison, Wis., areas.

The system will consist of 197 miles of 12-inch line and 18 miles of 10-inch line, with three pump stations and an initial capacity of about 65,000 barrels of products daily.

Badger Pipe Line Company also will purchase an existing eight-inch products line extending northward from Peru, Ill., a distance of 67 miles to Rockford.



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Beaver Model 77-Drive Threader is ideal for use with new Model-D.
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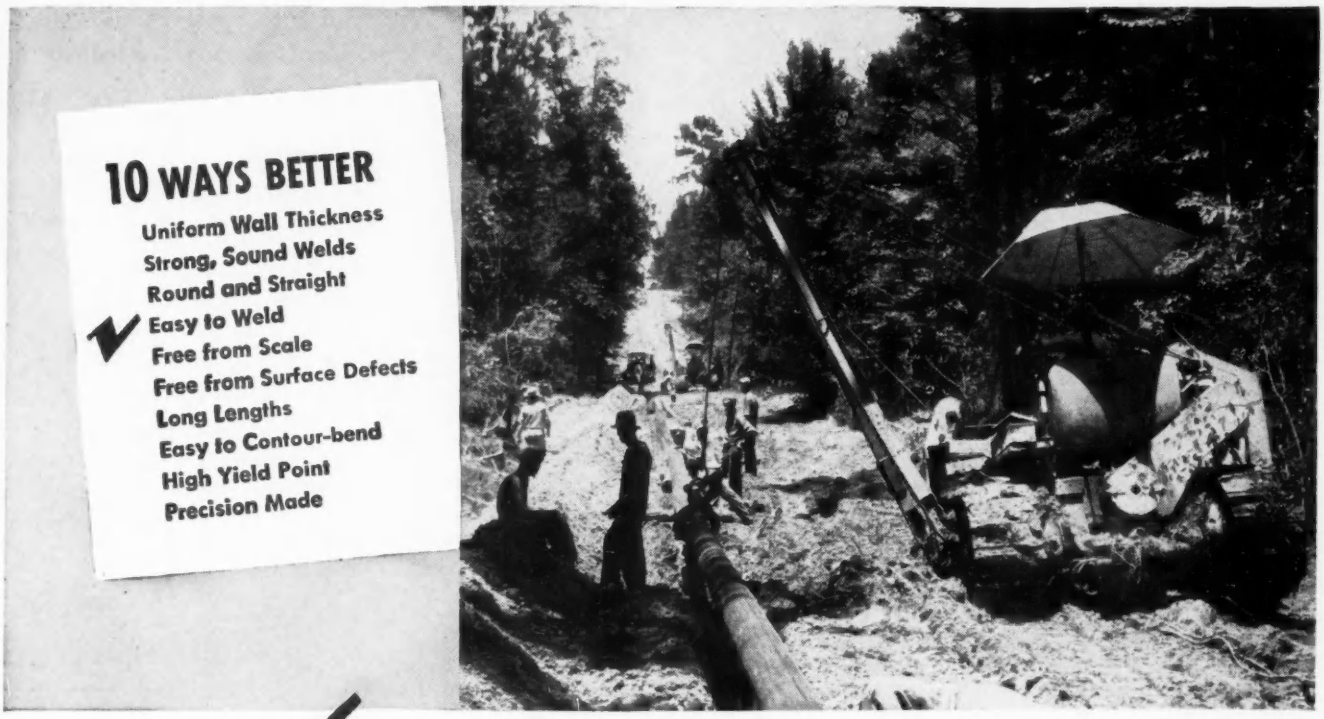
• Trouble-free, heavy-duty chuck with tons of gripping pressure!
• Safety-locked switch lever!
• Bronze spindle bearings!
• Attractive baked enamel finish!
• Parts interchangeable with Model-C.
Model-D with drive shaft geared tools Cuts and threads up to 8" pipe.
For Better Pipe Tools . . . Buy
BEAVER
254-300 DANA AVE. WARREN, OHIO



ENDS MATCH-UP RIGHT

...on Republic Electric Weld Line Pipe

The way Republic Electric Weld Line Pipe is made . . . from flat-rolled steel . . . assures you of getting pipe that is uniformly round and that has uniform walls. Your crews will find it easy to line up and easy to weld uniformly tight and strong, because carbon content is low.

The cost of laying Republic Electric Weld Line Pipe is predictable . . . a minimum of unexpected delays caused by field-welding problems—a minimum of delays to shift out-of-round pipe to obtain tight match-up of ends for welding—no delays because of poor pipe surface or defects.

All over the country, crews have been beating schedules in laying Republic Electric Weld Line Pipe. Pipe line construction budgets are being maintained. After back-filling, there are no worries about maintenance or leaks.

Increased facilities at Republic's large pipe plants make it even more possible for you to join the companies which have laid over 67,000 miles of Republic Electric Weld Line Pipe in 24 years.

REPUBLIC STEEL CORPORATION
GENERAL OFFICES • CLEVELAND 1, OHIO
Export Department: Chrysler Building, New York 17, N. Y.

Republic
REPUBLIC STEEL
ELECTRIC WELD LINE PIPE

Other Republic Products include Casing and Tubing—Carbon, Alloy and Stainless Steels—Studs, Bolts and Nuts—Heat Exchanger Tubes

Platte Pipe Line Company Will Increase Capacity

Crude oil is now moving through the entire 1149-mile Platte Pipe Line system including the extension of 12- and 14-inch pipe running from Byron, Wyo., via Oregon Basin to Chatham.

Directors of the company have authorized purchasing materials to expand capacity of the line from 110,000 barrels to provide daily throughput capacity of 145,000 barrels. The expansion will come through the construction of two new pumping stations, raising the line's total to six.

The two selected locations are at Holdredge, Neb., and Gower, Mo. The line's present stations are in Casper; Ogallala, Neb.; Marysville, Kansas; and Salisbury, Mo.

Indiana-Michigan Products Line Construction Underway

Standard Oil Company (Indiana) has started construction on a 238-mile refined products pipe line from Whiting, Ind., to River Rouge, Mich. Products will be supplied to the 10- and 12-inch line by the company's Whiting refinery.

PROPOSED PIPE LINE CONSTRUCTION

OWNER OF LINE	Length	Diameter in Inches	Type	ORIGIN AND TERMINUS	Remarks
American Natural Gas	1200	30	Natural Gas	Lowry, La.—Detroit, Mich.	Planned
Arkansas-Missouri Power Co.	140	2-10	Natural Gas	Clay Co., Ark—Campbell, Mo.	Planned
Atlantic Seaboard Corp.	29	26	Natural Gas	Cobb-Rockville, Md. line looping	Planned
H. W. Bass & Sons, Inc.	104	6			
	48	4	Products	Duval, Live Oak Counties, Texas	Planned
Bell Oil and Gas Co.	150	6 & 8	Products	Ardmore, Okla.—Drumright, Okla.	Planned
California-Oregon Pipeline Co.	103	6	Products	Crescent City, Calif.—Medford, Ore.	Proposed
Carolina Natural Gas Corp.	185	2-12	Natural Gas	Laterals to York, Clover, Fort Mill, S. C.	Planned
Chattahoochee Natural Gas Co.	70	..	Natural Gas	Floyd Co., Ga.—Summerville, Ga.	To connect with Southern Natural
Cities Service Gas Co.	44	20			
	25	16	Natural Gas	Oklahoma, Cleveland, McClain & Garvin Cos., Okla.	FPC Approved
Cities Service Pipe Line Co. (Badger Line)	215	12 & 18	Products	Chicago to Madison, Wis.	Proposed
Coast Counties Gas & Electric	40	3, 4, & 8	Products	Coast and Valley Region, Calif.	Proposed
Colorado Interstate Gas Co.	365	22	Natural Gas	Denver, Colo.—Green River, Wyo.	Proposed
	49.5	20	Natural Gas	Morton County, Kansas, to Hooker, Oklahoma	Planned
Columbia Gas System Subsidiaries					
United Fuel Gas Co.	60	30	Natural Gas	Lanham Station—Boyd Co., Ky.	
United Fuel Gas Co.	6	20	Natural Gas	Lanham Station—Burlington, Ohio	Will tie-in with Gulf Interstate Applied FPC
United Fuel Gas Co.	20	20	Natural Gas	Calhoun & Roane Cos., W. Va.	
Central Kentucky Natural Gas	5	20	Natural Gas	Menifee Co., Ky.—Means, Ky.	
Cumberland and Allegheny Gas Co.	31	12	Natural Gas	Garrett Co., Md.—Keyser, W. Va.	Planned
Equitable Gas Co.	9	12	Natural Gas	Wetzel Co., W. Va.—Marion Co., W. Va. Logansport Field	Authorized
Fort Worth Basin Gas Co.	Huge	24-30	Natural Gas	Novice, Brown, Comanche, Grayson Cos., Texas	Planned
Glacier Gas Co.	626	8-20	Natural Gas	Kalispell, Mont., Spokane, Lewiston, Ida., Trail, B. C.	Applied FPC
R. A. Goodall	45	6	Crude	Little Beaver Field—Merino, Colo.	Connect with Sterling System
Great Lakes Pipe Line Co.	130		Products	Nebraska City to Grand Island, Nebraska	Proposed
Home Gas Co.	32	12	Natural Gas	Breesport, N. Y.—Union Center, N. Y.	Planned
Home Gas Co.	17	12	Natural Gas	Hansock, N. M.—Sanford, N. M.	Planned looping
Hope Natural Gas Co.	33	8, 10 & 12	Natural Gas	Wyoming Co., W. Va.—Buchanan Co., W. Va.	Applied FPC
Interstate Power Co.	26	8	Natural Gas	Hooppole, Ill.—Clinton, Ia.	Planned
Iowa-Illinois Gas & Electric	22	8	Natural Gas	Mahaska Co., Ia.—Ottumwa Co., Ia.	Authorized
Lone Star Gas Company	36	12	Natural Gas	Stamford, Texas—Near Abilene, Texas	Planned—will use company forces
Missouri Public Service Co.	109.3				
	27.1	8 & 10"	Natural Gas	New Franklin, Mo.—Trenton, Mo. Laterals in Mo.	To connect with Panhandle Eastern
Montana Power Co.	52	16"	Natural Gas	Canada-Montana line to Cut Bank, Mont.	Planned
Natural Gas Producers	100.5	12	Natural Gas	Yenter Pool, Colo.—Denver, Colo.	Planned
New River Gas Co.	50	..	Natural Gas	Monroe, W. Va.—Dublin, W. Va.	Planned
Northern Indiana Fuel & Light	33	8	Natural Gas	Edgerton, Ind.—Auburn, Ind.	Planned
Northwest Natural Gas	992	18-24	Natural Gas	Alberta Fields to Seattle	Proposed
Ohio Fuel Gas Co.	23	16 & 20	Natural Gas	Wellington, O.—Elyria, O.	
	18	20	Natural Gas	Crawford Station—Columbus, O.	
	16	16	Natural Gas	Berlin, O.—Sandusky, O.	
	74	3-20	Natural Gas	Hocking, Knox, Ashland Cos., Ohio	
	47	20	Natural Gas	Hocking Co.—Columbus, Ohio	
	61	20	Natural Gas	Northern & Southwestern Ohio	
	31	20	Natural Gas	Licking Co., O.—Richland Co., Ohio	
	33	20	Natural Gas	Jefferson, O.—Seneca, Ohio	
Pacific Gas and Electric Co.	178	34	Natural Gas	Topock, Ariz.—Milipitas, Calif.	Authorized
	8	..	Natural Gas	Milipitas, Calif.—Irvington, Calif.	
	14.5	12¾	Natural Gas	Sacramento—Salida—Bangs Ave. Sta., Calif.	
	20	16	Natural Gas	Burrel, Calif.—Easton, Calif.	
	12	20	Natural Gas	Holm to connect to Topock line.	
	15.5	12¾	Natural Gas	Madera Co. to Livingston	
Pacific Northwest Pipeline Co.	1466	26	Natural Gas	Ignacio, Colo.—Seattle, Wash.	Applied FPC
	380	..	Natural Gas	Pocatello, Ida.—Yakima, Wash.	Laterals—applied FPC
Pasotex Pipe Line Co.	146	10	Crude	Snyder, Texas—Wink, Texas	Planned
Phillips Petroleum Co.	54	6	Products	Goldsmith, Texas—Borger, Texas	Planned
	52	10	Products	Brookshire, Texas—Sweeny, Texas	Planned
Powder River Pipe Line Co.	40	8	Crude		
	12	6		Salt Lake City, Utah—Kaysee, Wyo.	Proposed
Rockland Light & Power Co.	22	8	Natural Gas	Orangetown, N. Y.—Tompkins Cove, N. Y.	
Roosevelt Oil & Refining Co.	22	4 & 6	Crude	St. Helens, Mich.—Norwich, Mich.	Planned
Salt Lake Pipe Line Co.	40	6	Products	Adams, Ore.—Pasco, Wash.	Planned
Service Pipe Line Co.	185	16	Crude	Bowie, Texas—Drumright, Okla.	Proposed
Shenandoah Gas Co.	39	3-48	Natural Gas	Middleton, Va.—Martinsburg, W. Va.	
Socony-Vacuum Oil Co.	30	24	Crude	Canada Border—Ferndale Wash.	Planned
	135	12 or 16	Crude	Fosterton, Sask. to connect with Interprovincial line	Proposed
South Carolina Natural Gas Co.	522	10, 12, 16	Natural Gas	Aiken, S. C.—Charleston, S. C.	Authorized
South Georgia Natural Gas	339	2-12	Natural Gas	Phoenix, Ala.—Tallahassee, Fla.	Authorized
Southwest Gas Corp. Ltd.	26	..	Natural Gas	Pacific Gas & Electric line to Victorville, Calif.	Planned
Tennessee Gas Transmission Co.	574	30	Natural Gas	Kinder, La.—Portland, Tenn.	Authorized by FPC
	130	30	Natural Gas	Looping in Texas and Louisiana	Authorized by FPC
	63	26	Natural Gas	Ohio and Pennsylvania	Authorized by FPC
	45	20	Natural Gas	Buffalo, NY.—St. Catherines	Authorized by FPC
Texas Eastern Transmission	17	6 & 8	Natural Gas	Big Hill field, Texas to Provident City-Beaumont line	Applied FPC
Trans-Northwest Gas., Inc.	246	18	Natural Gas	Osoyoos, B. C.—Washington & Idaho	Applied FPC
	275	10¾	Natural Gas	Branch Lines	Applied FPC
Triangle Pipe Line Co.	560	12	Products	Arkansas City, Kans.—Nashville, Tenn., and Covington, Ky.	PAD approved for fast amortization
Tuscarora Oil Co. Ltd.	360	10 & 12	Products	Linden, N. J.—Midland, Pa.	Planned
United Natural Gas Co.	50	12	Natural Gas	Elk Co., Pa.—Jefferson Co., Pa.	
West Coast Pipeline Co.	953	24 & 26	Crude	Wink, Texas—Norwalk, Calif.	Inactive
Williston Basin Pipe Line Co.	244	8	Products	Billings, Mont.—Glendive, Mont.	Proposed

PIPELINES

Across the nation

- Products Pipelines
- Oil Lines
- Water Pipelines
- River Crossings
- Gas Pipeline Construction

R. H. FULTON & COMPANY
CONTRACTORS

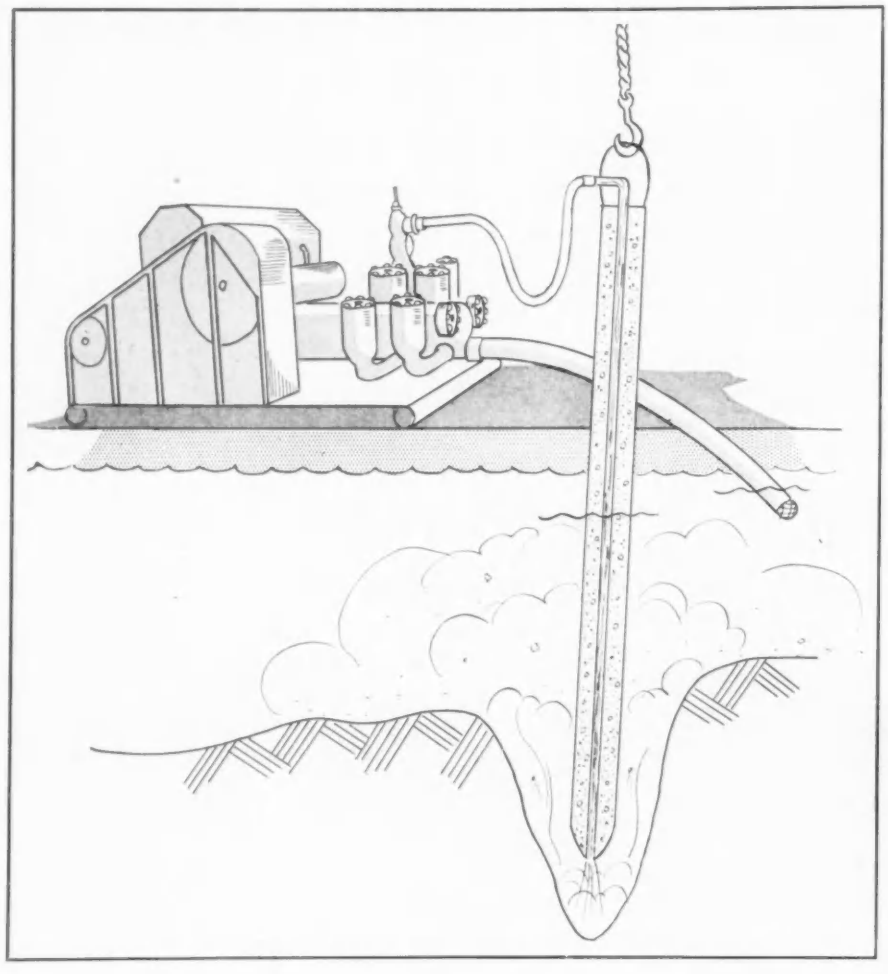
PHONE 5-5231 BOX 1542

LUBBOCK, TEXAS

How to do it

PIPE LINE HINTS

$10 is paid for each illustrated acceptable contribution. Mail to The Editor, WORLD OIL, P. O. Box 2608, Houston 1, Texas.



Jetting Piling for Small Crossings

Using a conventional oil well pump, it is possible to jet piling to proper depth in a fraction of the time it would take to drive it. This system provides an easy means of making pile clusters for supporting small river and creek spans. At the same time it saves money that would be spent in moving pile-driving equipment into difficult right-of-way locations.

As shown in the drawing, the piles are made of pipe filled with concrete which surrounds 1½-inch jet line in the center. This line ells at the top to connect with the high pressure reciprocating pumps. The lower end of the pipe is bull plugged and welded to the 1½-inch jet line.

A bale at the top of the pipe provides a means of supporting the piling while it is being jetted down to proper depth. As a rule, it will be possible to jet the piling down in a few minutes time; then once the pump is stopped, the earth will quickly close around the pipe, giving it proper bearing capacity.

Publicizing Slogans

Drive home safety slogans by printing them on paper cups used by employes. This is inexpensive and perhaps more effective than conventional safety posters. It will be especially effective on construction jobs in summertime when water consumption is at its peak. The paper cup device is also a good way to put over other campaign slogans to employes.

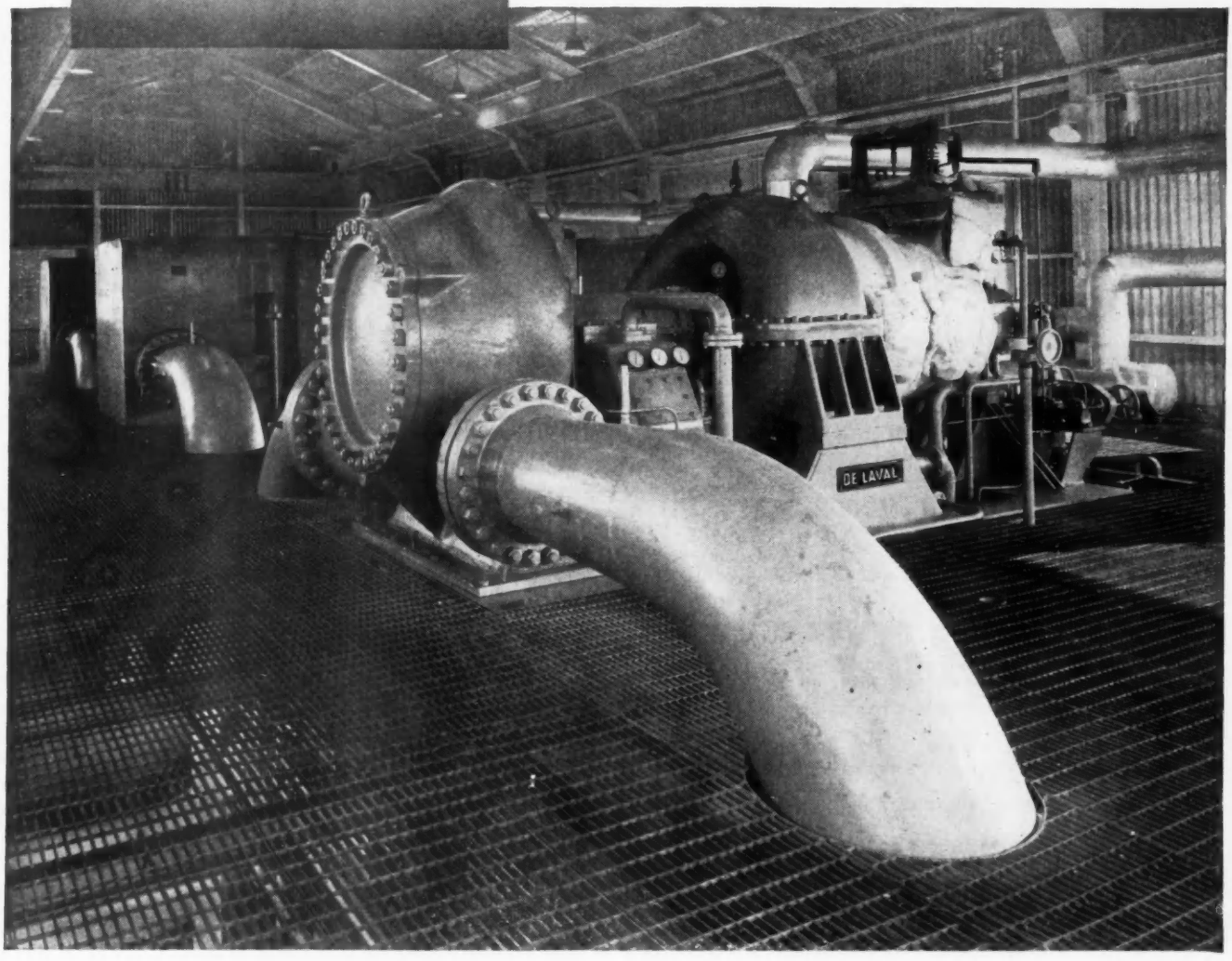
Keeping Station Clean

A foot scraper mounted just off the sidewalk outside the main door of the compressor building helps materially in reducing the janitor work during the wet season in a natural gas compressor station.

Make the device from a section of steel floor grating, a piece of flat three-sixteenths-inch by four-inch by fourteen-inch steel welded to the back side and supported on pieces of one-inch diameter pipe at the four corners at

DE LAVAL
CENTRIFUGAL COMPRESSORS

on the job at Transco



Today's modern, long-distance, high pressure gas transmission lines can't afford weak links. That's why the Transcontinental Gas Pipe Line Corporation selected these three efficient De Laval 5,000 hp steam turbine-driven centrifugal compressors for their Tylertown, Mississippi station.

There are sound reasons for their selection. The De Laval high pressure shaft seal eliminates leakage. Consumption of sealing oil is negligible. There is only one moving part—the rotor, which has ample clearances. These units are also compact, require smaller foundations and smaller stations. What's more, first cost and installation costs are low.

If a careful study of your needs indicates that centrifugal compressors are practical from an economic standpoint, it will pay you to consult our engineers. They can give you the benefit of our practical experience on all four of this country's major pipelines.

DE LAVAL *Centrifugal Compressors*

DE LAVAL STEAM TURBINE COMPANY
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DL154

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A Pipe Line Contractor LARGE Enough to Handle Any Job Economically . . . SMALL Enough to Enable ALL of Our Partners to Know Every Customer Personally

During 1952 our jobs included over 775 miles of pipe line . . . mostly in the Gulf Coast area of Texas, Louisiana, and Mississippi. Of this, 671 miles was 30" pipe or larger. Each Partner has well over twenty years experience in pipe line construction which includes thousands of miles of pipe line involving every known pipe line construction problem. Put this experience to work for you by calling on RIVER CONSTRUCTION CORPORATION for New Construction, Marine Crossings, Taking Up and Reconditioning Old Lines.

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General Offices: 6100 CAMP BOWIE BOULEVARD, FORT WORTH, TEXAS

ROBERT THOMAS, Vice President and General Manager

J. C. BRISCOE, Vice President K. C. BIEDERMAN, Chief Engineer J. C. MINYARD, General Superintendent

a height of 1½ inches above the ground level.

Usually the material used such as discarded floor grating, short pieces of pipe and a flat piece of steel can be procured from the scrap metal pile. It takes but a few minutes of a welder's time to fuse the parts together.

Racking Equipment

A handy rack for hanging hip boots, shovels, wrenches, etc., in the equipment building can be made as shown from scrap two-inch pipe, a two-by-eight plank, several lengths of one-fourth inch iron rod, a couple of nuts and bolts, and two short lengths of scrap iron.

The framework is made first by welding together two-inch pipe. Curved pieces of steel rod are welded to the crossbar of the rack as shown. On the opposite side of the crossbar, two strips of scrap iron with a one-quarter inch hole in the ends are welded to the crossbar. These will eventually hold the two-by-eight. Holes are drilled along the two-by-eight for mounting short sections of steel rod. These holes should be spaced far enough apart to accommodate hip boots, shovels, etc. The two-by-eight is bolted to the rack.

Send a picture and written description of your Pipe Line Hints to The Editor, WORLD OIL, P. O. Box 2608, Houston 1, Texas.

Now "Varec" offers a new Remote Reading ELECTRONIC TANK GAUGE RECEIVER . . .

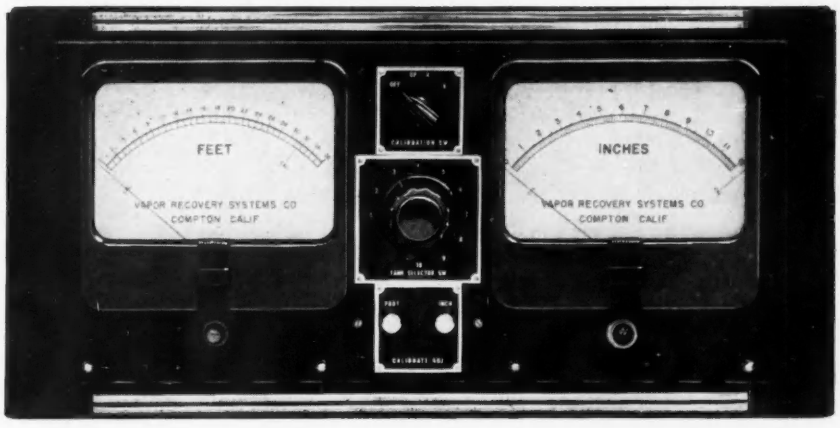

FIGURE NO. 8800 SERIES

. . . for 36-foot Range Tanks and Smaller

SPECIAL DESIGN—This new "Varec" RECEIVER has the many advantages of our larger range RECEIVERS, but is especially designed for tanks not exceeding 36 feet in height.

INCREASED EFFICIENCY—Reduces operation costs and increases plant efficiency. Provides accuracy, unusual speed, sensitivity.

EASY READING—Allows larger increments on foot-reading scale, permitting easy reading.

FLEXIBLE INSTALLATION—Designed in Standard, Relay or "On Gauge" types in cabinet or panel styles and can be used with electronic alarms or controls.

CHOICE OF CALIBRATION—English, Metric or special calibration as desired.

REASONABLE UNIT COST—With all its attractive features, this Figure Number 8800 SERIES RECEIVER has a very reasonable first cost.

Get all the details and illustrations in Bulletin CP-3004, just off the press.

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Keep Rights-of-Way Cleaned Up

You can maintain oil and gas line rights-of-way better, quicker and at less cost with a Caldwell S-2 Rotary Brush Cutter. The 57-inch Spring Steel Blade will cut brush up to two inches thick, and better, and will do it in a once-over. Trouble-free operation. Timken Bearings, Blood Bros. Universal. Users include Tennessee Transmission, Transcontinental, Texas Illinois Transmission, others. We'll give you a demonstration. Write Dept. W.

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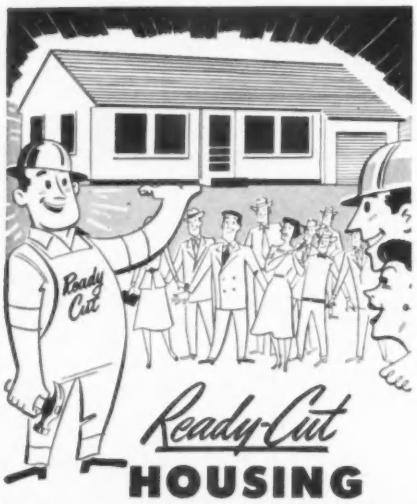

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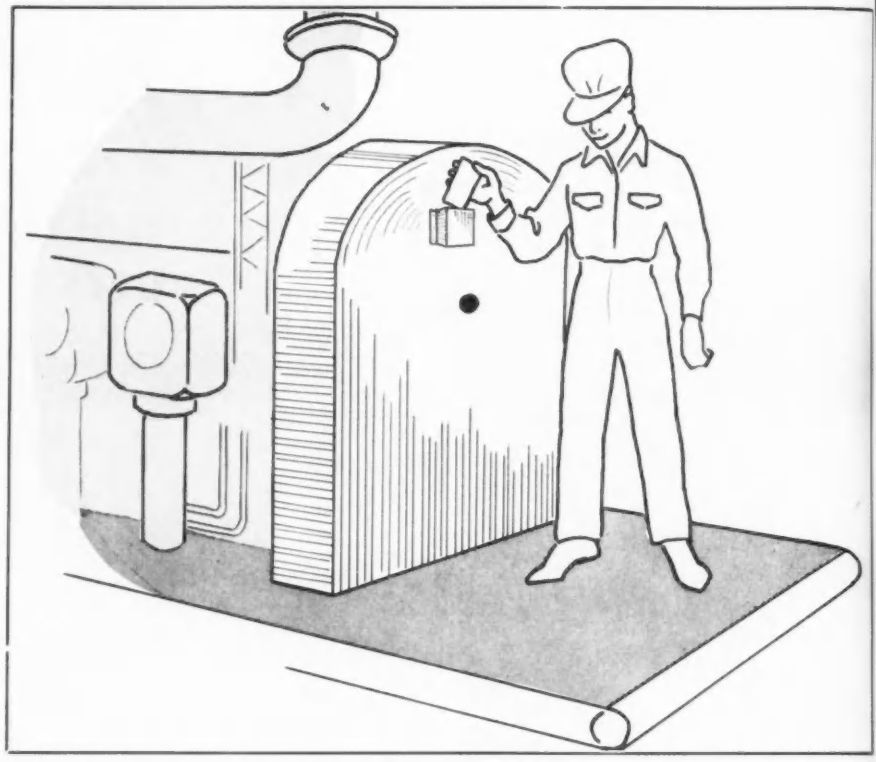
HINTS . . .

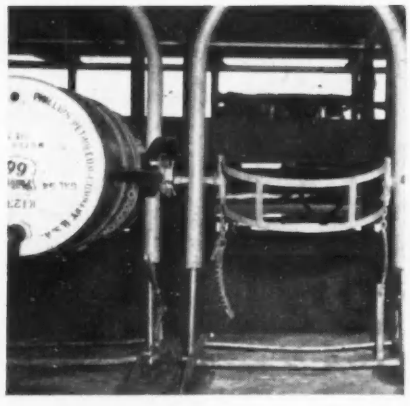


Keeping Engine Performance Data

A small metal card holder mounted on the flywheel guard of compressor and pump engines provides a handy place for crews to pass on information regarding an engine's performance. Also it is a handy place to file information on a specific engine's performance.

For example, it is a simple matter to run a check on the amount of oil added to an engine crankcase by recording the quantities of oil on a card as the additions are made.

The box is made from light gauge galvanized plate. Cut a rectangular sheet 7½ inches wide and 6½ inches deep. Cut one inch square notches from two of the corners and crimp into a box shape that can be bradded to the flywheel guard as shown in the drawing.



Handling Drums

A clever device for handling oil drums was erroneously represented in World Oil's Pipe Line Hints for September, page 262, as a field-made device. The barrel holder is patented and manufactured by Henry H. Paris Distributor, Inc., of Houston.

With this device, illustrated here, the drums can easily be rolled into place, clamped around the middle, and then tipped into horizontal position to pour. Moreover, the rack can be moved easily from place to place.

GUNITE COATINGS FOR PIPELINES

One section of "GUNITE" coated 24 inch dual crossing at the Colorado River near Smithville, Texas. We did a similar job at the Brazos River. Reinforced "GUNITE" was placed over a mastic coating.

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Fargo west to Bismarck...

• 202 miles of 10" products line, laid by Associated for Standard Oil Company of Indiana. It pays to associate with Associated.

ASSOCIATED
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P. O. Box 2163 **LI-7561**

HOUSTON, TEXAS

Locating Extinguishers

Red paint and a piece of scrap metal will make fire extinguishers easy to locate in an emergency.

If affixed to a post, which ordinarily prevents its being seen from the opposite side, the extinguisher can be readily located by the red-painted metal background. Cut a tongue at one end of the metal to a size fitting the slot on the extinguisher. Hammer it back to the proper angle, forming a hook, as shown. Weld the shield to the post.

If the extinguisher is fixed to a wall, make it easier to spot by painting a bold red circle behind it.

On the Move . . .

The oil these companies produce, purchase, transport and terminal is always *on the move.*

Literally, it's here today and gone tomorrow.

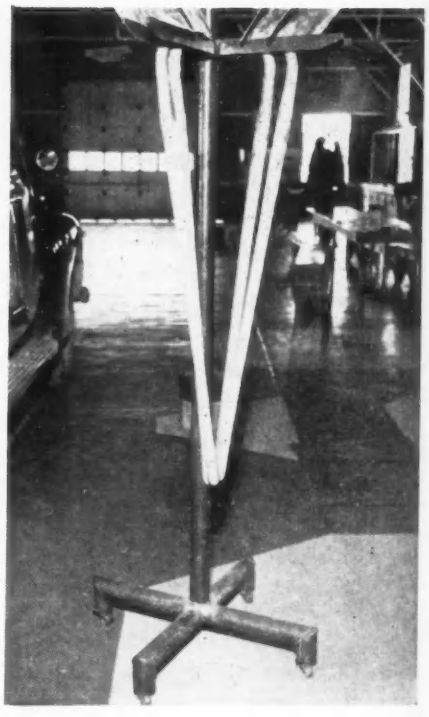
Each month we handle approximately 1,500,000 barrels of crude, and all of it, including that we produce, and that fed into the lines by others, is handled through our own system.

The SOMICO emblem itself is always *on the move.* It is appearing in new areas in South Texas, as well as in other regions of the State, as we work with others to find and develop new reserves to the end that our country's economic and defensive strength may continue unquestioned and unchallenged.

If you have a crude oil transporting or marketing problem in South Texas the chances are we can help you whip it. We are always looking for new "connections" . . . for a chance to keep oil *on the move.*

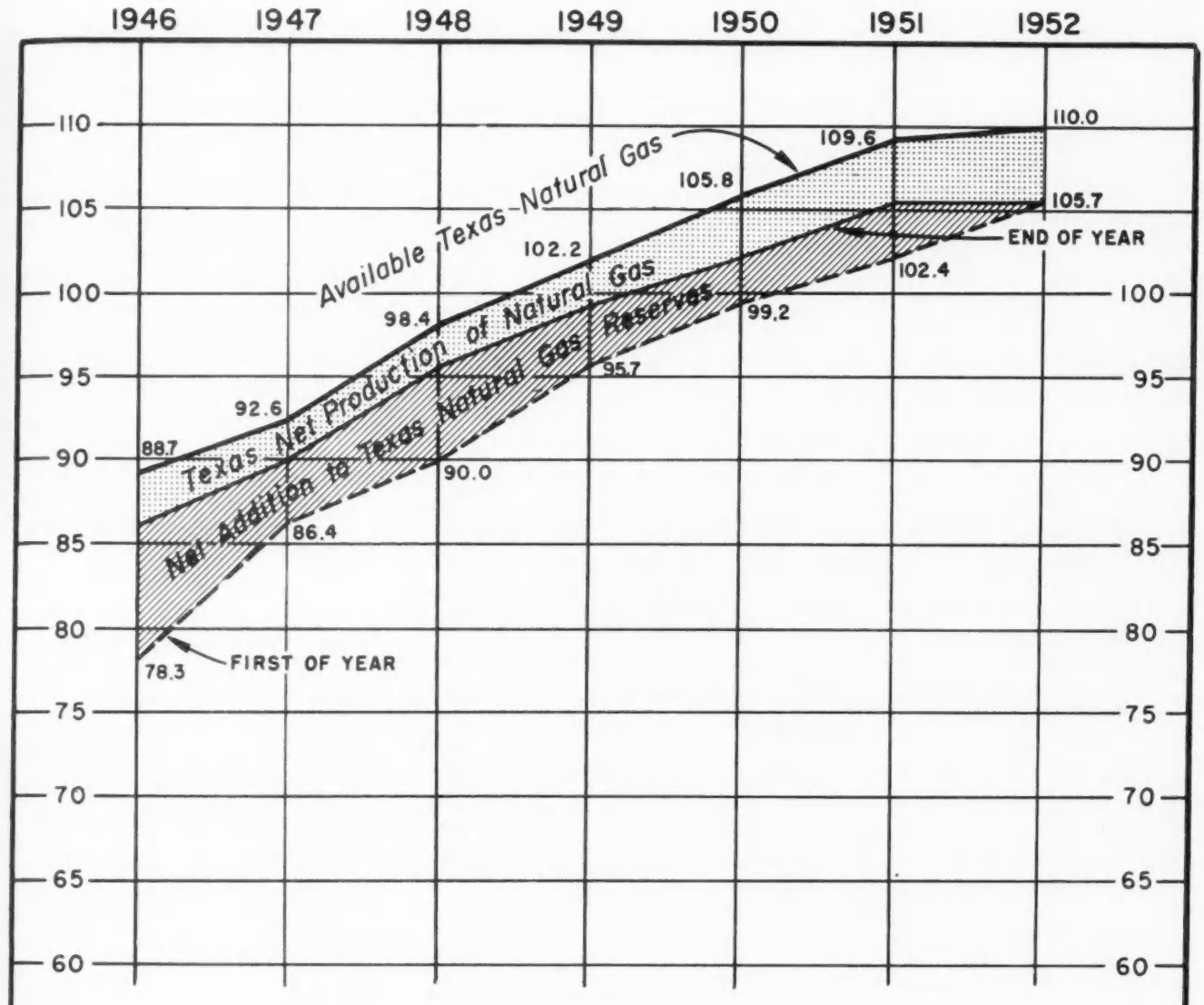
SOMICO

Southern Minerals Corporation
Southern Pipe Line Corporation
Corpus Christi, Texas



Holding Shovels

Shovels are within reach on this shovel stand. The base and upright are made of two-inch pipe. Ordinary casters such as those used on an old-fashioned kitchen table are welded to the base. The four arms for holding the shovels were fashioned from 3/8-inch steel plate. It is not necessary that the upright pole be as long as the one illustrated.

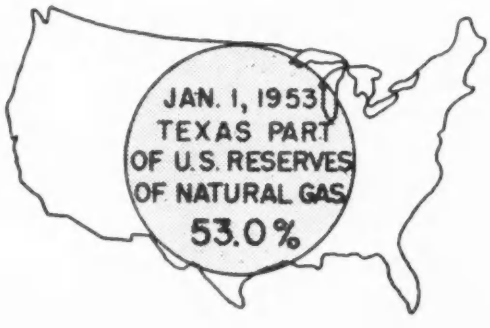


TEXAS

NATURAL GAS RESERVES

(IN TRILLIONS OF CUBIC FEET)

SOURCE: U. S. BUREAU OF MINES
AND AMERICAN GAS ASSOCIATION



PREPARED BY

TRANSCONTINENTAL GAS PIPE LINE CORPORATION

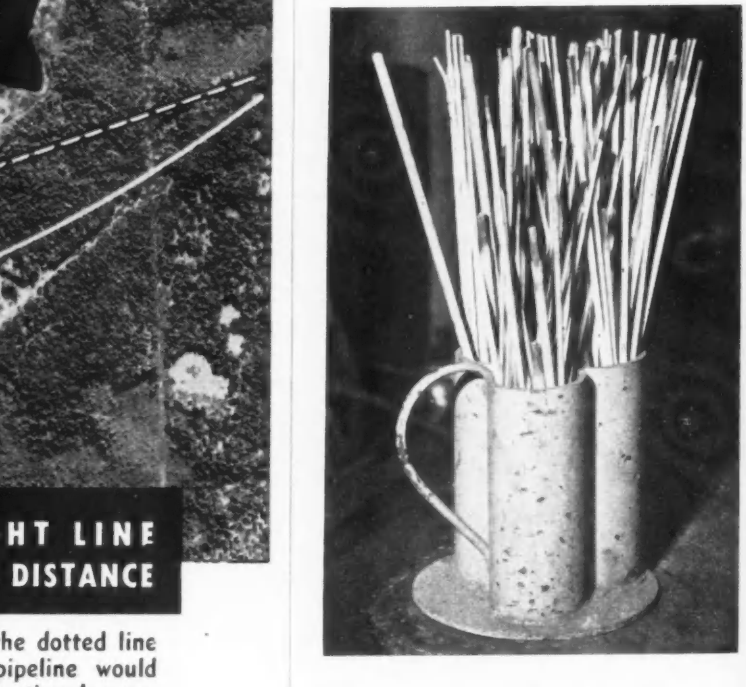
ENGAGED IN MAKING A MARKET FOR
TEXAS–LOUISIANA NATURAL GAS

Speeding X-Ray on Crossings

A simple wrap of asbestos felt can speed X-raying on most river crossings. As a rule, the lead film holder is not placed around a weld until it has cooled. This cooling off period keeps the lead shield from melting.

On river crossings where pipe is "stove-piped," work is usually done in five stages. The first stage is to line up the pipe, make the stringer bead and hot pass. At the second stage the weld is completed; at the third stage it is X-rayed and primed. At the two subsequent stages, field molds are applied. As a rule, work at the x-ray stage lags behind the rest. On hot still days welds are slow to cool, often slowing the entire job.

One company solved this problem by wrapping the asbestos felt around the hot weld, so that X-raying could proceed immediately. This simple device was used to speed up work on a river crossing where X-raying was the main source of delay.

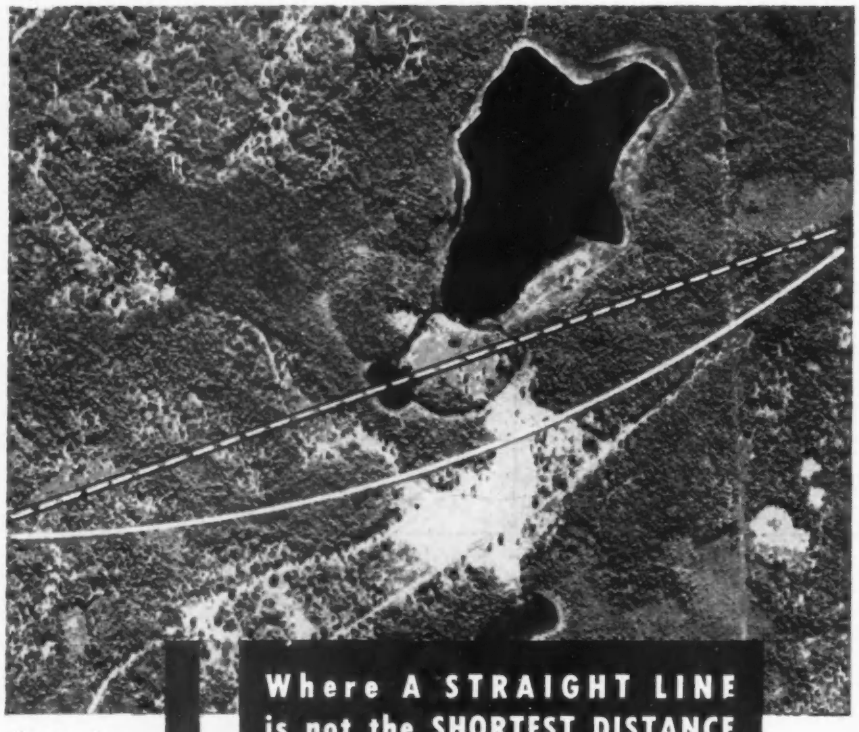


Keeping Welding Rods

A handy receptacle for welding rods can easily be made from three short sections of 1½-inch pipe, a small sheet of steel plate and a short section of ¼-inch rod.

Weld the three sections of pipe upright on the steel plate, clustering them as shown. Bend the ¼-inch rod into a curve and weld it to the side for a handle.

By using three sections of small pipe instead of one large section the welding rods stand upright better and are easier to remove.



Section of an Abrams Aerial Mosaic: Scale 1" = 1000'.

Where A STRAIGHT LINE is not the SHORTEST DISTANCE

On this aerial photograph the dotted line shows where a proposed pipeline would have been routed using conventional maps. The solid line shows the actual route based on an Abrams Aerial Mosaic. Aerial photography instantly showed that bending the line would eliminate crossing a stream, expensive resort property and a small lake —that, measured in time and money, a straight line here was not the shortest distance. Save your time and money; use Abrams Aerial Surveys to show you the shortest practical routes for your pipelines.

For complete information send for your copy of "Pipeline Planning from the Bird's-Eye View," and the brochure "Aerial Surveys and Maps from Photographs."

ABRAMS AERIAL SURVEY CORPORATION
LANSING 1, MICHIGAN, U.S.A.

Photo courtesy International Petroleum Company

Tank farms like this at Talara point to Peru's growing stature as an oil country. The nation has pushed aside worry over handouts and world-wide nationalistic trend to find that success lies in allowing honest profit for honest labor . . .

Peru . . . Modern-Day Trail Blazer

By DR. CORNELIUS H. ZONDAG

MOST PEOPLE associate Peru with the fabulous civilization of the Incas. Certainly, not many will associate it with progressive capitalism. Yet, in a country where centuries ago the Incas lived under a form of socialism which would have made Lenin's mouth water, a modern farsighted government is now proving once more that capitalism is still the shortest way to progress.

To a socialist-ridden world where government handouts and nationalization tactics have gradually become the standard "cure" for all ills, this may seem strange. Yet the case of Peru shows clearly the almost forgotten truth that *adequate legislation and the creation of a proper investment climate are the principal prerequisites to raising the standard of living of the underdeveloped countries.*

In Peru the new era started in 1948, when the country was in bad shape. It was so bad that President Manuel Odria decided it was time to take a firmer grip on the government. For a while there was the ordinary military junta, until elections could again be held in 1950. But the new government did more than just restore political freedom: it became concerned with progress in a most unusual way.

Turning from the idea of calling in foreign government experts, whose advice often tends to be identified with the governments they represent and serve, President Odria called on the private management consultants firm of Klein and Saks, and listened to what they had to say.

Dr. Julius Klein's first suggestion—that the artificial rates of the sol be abolished—was quickly followed, along with throwing overboard the numerous and often conflicting controls which had developed into a real pattern of obstruction. In suggesting this step, Dr. Klein, who had been undersecretary of commerce under former President Hoover, adhered to his fundamental hobby horse—that exchange is merely the "thermometer" which indicates the "temperature" of the international economic life of a nation. Thus, he felt any attempt to control such a recording device was as futile as an effort to affect the climate by restricting the function of the ordinary thermometer. Peru's exchange stability today, as compared with some of its neighbors', is ample proof of the soundness of this decision which has kept costly bureaucratic meddling with the national economy at a minimum.

Mining Laws Changed. Realizing that the basis of Peru's progress must lie in the development of its mineral wealth, Klein then suggested a change in the mining laws, as well as im-

provement in the country's tax structure, in order to attract foreign "risk" capital. In 1950 a new mining code was adopted which resulted in a substantial investment program by some of the largest American mining concerns.

Cerro de Pasco Copper Company is now carrying out an impressive expansion program, while American Smelting and Refining is going ahead with an investment of over $100 million during the next few years. The cotton firm of Anderson and Clayton is spending money on large-scale irrigation projects, and many other firms are preparing to join the bandwagon of Peru's progress.

Then came the year 1952—a milestone for Peru. After years of fruitless squabbles and deliberations, a new oil law was passed and some foreign investors started to come in. This in itself was remarkable, for the new oil law is by no means an oil man's dream, but it is workable. The law contains a good many features which are not too attractive, although some of the sting was wisely removed by the petroleum regulations.

The new petroleum law divides the country geographically into four different regions (including a continental shelf zone) each with its own operating terms which vary in accordance with the difficulty of the area. Taking the most accessible coastal areas as a basis, the law incorporates a 50-50 profit-sharing plan between the government and the industry, a device usually applicable only to countries such as Venezuela or the Middle East where large scale production has already been developed.

The law establishes an ad valorem export tax on oil which is to vary from 20 percent in the coastal area to 3 percent in the least accessible regions and which is in the nature of a prepayment of the 50 percent income tax. The law contains no royalty provision. It establishes a straight amortization of exploration expenditures, as well as a depletion allowance which varies from 15 percent to 27½ percent (not to exceed 50 percent of net profits) in accordance with the difficulty of the area.

Reserves Set Up. In addition to certain national reserves which are expressly set aside, the law further provides for the establishment of a general government reserve. The reserve amounts to 50 percent of any exploration concession area, which upon conversion may be explored or developed by the state either directly or in conjunction with national capital, by national capital alone or else may be auctioned off in accordance with the provisions of the law.

This, in effect, gives the government another advantage—enabling it to acquire choice areas at the expense of the original operator who took all the risks. Refining and transportation concessions are not covered by the 50-50 principle but are subject to normal taxes. There is a provision, however, that the companies must supply the local market at prices fixed by the government—which may result in considerable hardship on them as domestic consumption increases.

In brief, it may be said that while the new law may be workable in the readily accessible areas such as the coastal region and the Sechura desert, it is still doubtful whether at today's oil prices it will contribute substantially to the development of the potentially rich oil areas across the Andes. At any rate, it is interesting to note that in spite of the abovementioned unfavorable features, several large American companies decided to take the gamble.

In addition to a number of local investors, such as the Gildemeister interests (Cia Petrolera Peruana SA), the A and F. Wiese interests, the Consorcio Minero, which enjoyed a certain initial preference, a number of foreign concerns, including two Canadian companies, have now acquired concessions. Investors from abroad also include the Cia Sudamericana de Petroleo (Peruvian Argentine interests) and Peruvian Oil Concessions (Argentine-American interests).

American concerns acquired concessions totalling more than four million acres, out of a total of about ten million applied for. Deposits and registration fees alone brought $1.5 million to the government in 1952. If the present trend continues, investment by the U. S. petroleum industry within the next few years may well run into several hundred million dollars.

At present, the Sechura desert along Peru's northern coast is considered the most promising area. It has been covered almost in its entirety by concessions.

The new law very wisely made a definite effort to let the Peruvians have some stake in this new industrial development if they wanted it. Article 17 provides a 90-day option for national capital to take up at least 30 percent of the shares of newly established companies backed by foreign capital, thus putting the challenge squarely up to the Peruvian investor.

Response Surprising. The response from foreign capital to the new law has been somewhat of a surprise to some old hands in the industry, many of whom consider the law unattractive in the light of Peru's unknown geological prospects. Yet, present developments show that investors apparently have decided to take seriously Peru's efforts to attract risk capital from abroad. Peru's 1952 settlement of its dollar debt probably constituted another step in restoring investors' confidence.

Facing serious difficulties in 1948, Peru is now a thriving country. With imports of foreign merchandise practically frozen just a few years ago, today foreign cars, imported machinery and even simple luxuries abound. In addition to private investment, the government is now embarking on its own development program which includes, among other things, an impressive road building program.

Peru's example is enlightening in many ways. In all the talk heard about the plight of the so-called underdeveloped countries, people forget all too often how much poverty in this world is really man-made, and could be remedied by proper legislative or administrative action. There are too many instances where progress is held back either by failure to act or by deliberate action to stop it.

For example, it is significant that in Peru both the conservative as well as the leftist elements for a long time opposed the idea of giving greater opportunities to foreign capital. The

conservatives feared loss of their estates because of mounting labor costs occasioned by rising industrial wages and the inflow of foreign capital. Radicals were interested in keeping living standards low so as to provide a more fertile soil for communism.

In Peru's present approach to its problems, there is a minimum of bureaucratic organization and a maximum of sound philosophy and legislation. Rather than embark on spectacular government projects for which it lacked the proper resources, Peru decided to stick to the almost forgotten art of living within its means.

Plug for Capitalism. Peru's experiment has demonstrated once more that, above all, it is the philosophy of capitalism which counts in bringing about progress. All too often, Americans have been told by friends abroad that the real reason for American prosperity and productivity is the fact that the country had boundless resources to start with, thus giving no credit at all to the spirit of free enterprise which has been such an important factor in America's progress. Without this philosophy, most of our resources would today still lie untouched.

If we want to cure poverty the world over, the cheapest way to do it is to have this philosophy accepted on as wide a scale as possible—which would be a direct contrast with our past policy of trying to buy friends through government grants and handouts.

Although it may be merely coincidence, it is interesting to note that with the change in our own attitude in respect to foreign aid, some countries already seem to be taking another look at private foreign investment, particularly in the field of petroleum development.

Turkey, long bent on a policy of developing its own petroleum resources, with the standard result of no development, is now seeking the aid of private capital to do the job. The Turks need oil badly to carry out their ambitious plans to modernize the country.

Even Argentina, with a moderately successful government petroleum monopoly, now seems to recognize that to carry out an impressive second five-year program, help from the foreign companies would be a great asset, if not a must. Apparently, Peron was greatly impressed by the recent flow of foreign capital into Peru after the country changed its petroleum policy. Thus, Peron's admission and Peru's example may well contribute to the opening of the eyes of other countries.

Resources Unproven. Indeed, Peru's case shows clearly that restrictions on capital investment, the fear of expropriation or confiscation, as well as troublesome controls, can be the biggest deterrents to prosperity. Of course, some say that the case of Peru is really a special one because of her mineral resources. It must be remembered, however, that insofar as oil is concerned, these resources are far from proven as yet.

Furthermore, assuming that these resources were there all the time, it is curious that nothing happened to them until the Peruvians themselves decided to do something about them by reestablishing foreign investors' confidence. This explains better than anything else why 80 percent of the foreign capital now flowing to Peru comes from the U. S., while little of it goes to neighboring countries.

As for the argument of resources, Switzerland is a perfect example of what a truly democratic industrious nation can accomplish with hardly any natural resources.

The experience of Peru is all the more significant since Peru certainly did not even go out of its way in trying to attract foreign capital to develop petroleum possibilities. As pointed out already, the new law leaves a lot to be desired from an oil man's point of view. Nevertheless, it probably constitutes the best compromise available under the circumstances.

With proper legislation, Peru might long ago have been another Venezuela. However, in view of the generally enlightened spirit which seems to prevail under the present regime, it may well be that Peru will be encouraged to further liberalize its petroleum policy to get maximum benefit for itself and for the free world, which undoubtedly will have need for its oil in the future.

It is interesting to note that the government recently authorized some price increases for petroleum products which the companies operating in Peru had sought in vain for many years. Because of this price control, which forced the producing companies to sell their products below cost in the local market, gasoline in Peru has been the cheapest in the world. This resulted in a corresponding loss to the operators and a decline in production which eventually would have turned Peru into a net importer of petroleum. It took political courage to increase prices, a quality of which President Odria seems to have plenty.

Although most of the interest is now centered in the coastal zone where only short pipe lines are required, there is a chance that a further liberalization of the oil law may lead to a revived interest in the trans-Andean regions, despite exceedingly heavy investments which would be required. So far, two American companies have applied for any large acreage in this region.

The lesson to be learned from all this is very simple, yet it is so very fundamental that it sometimes seems to be forgotten. Instead of following the old familiar tune of what the U. S. should do for other people, Peru went ahead and showed what Peruvians can do for Peru. Their courageous trail-blazing at a time of ever-increasing nationalism has illustrated once more to the world that nothing will create progress faster than the chance for an individual to earn an honest dollar . . . and be allowed to keep the better part of it.—**The End.**

TANKER TIES UP at one of two docks at Canadian Oil Refineries, Ltd.'s Froomfield, Ontario, plant. One dock is used for unloading crude; other for loading refined products.

Canadian Tankers Are Still Busy

Despite increase in pipe lines . . . marine deliveries remain at a high level.

By HARRY CHAPIN PLUMMER

CANADIAN OIL interests are preparing for greater, speedier deliveries of water-borne cargoes of fuels, lubricants and petroleum products despite the formidable increase in oil pipe line construction in Canada during the past 14 years.

Last year's total of pipe line mileage completed and opened to flow amounted to 2500 miles. Before this year ends, 3159 miles are expected to be in operation. In 1939, 189 miles of pipe lines were built.

Since some of the more recently projected pipe line construction, such as the Trans-Canada and Westcoast Transmission lines, traversing such mountainous barriers as the Rockies of Alberta and British Columbia, are not primarily operations beyond tidewater for coastal or overseas deliveries, marine tankers can be expected to continue servicing needs along the British Columbia and Alaskan coasts.

And that will ultimately evolve appreciable export movement by tanker to overseas markets more economically reached through the ports of Vancouver and Prince Rupert ports. Therefore, expectations that increasing pipe line mileage might play hob with tanker services in overseas, Atlantic and Pacific coastal, river, canal and Great Lakes "trades" are unsupported.

It did appear for a time that there might be a substantial reduction of marine deliveries of northbound cargoes from the Gulf of Mexico, Venezuelan and Colombian ports, heretofore major sources of Canadian oil imports. However, the country's most easterly pipe line undertaking actually speeded up the sea movement into Portland, Maine, toward the more populous and highly industrialized centers of Montreal and Quebec city, as well as the soon-to-materialize big scale iron ore and railway development at Seven Islands, on the St. Lawrence river's lower gateway to the Labrador deposits.

New pipe lines leading into Great

Lakes ports have caused abandonment of old water routes, dislocation and realignment of others. One example is the projected extension of the 1150-mile Edmonton, Alberta-Superior, Wisconsin Interprovincial pipe line from its present terminus to Sarnia, Ontario, another 500 miles plus. The long water haul from Superior to the Ontario refining center on the Saint Clair river, north of Windsor, Ontario, will retire from that run some of the largest and fastest of Lake tankers.

Plenty of Jobs. But jobs aplenty will be found for them far afield from the accustomed routes and out of new bases at Toronto, Hamilton and Clarkson, on the north shore of Lake Ontario, and Sarnia. They will deliver cargoes to marketing centers and areas that, a few years ago, did not exist.

Actually, only one tanker route in the St. Lawrence River-Great Lakes "trade" has been curtailed. That resulted from the joint action of three oil refining interests—McColl-Frontenac Oil Co., Ltd.; British American Oil Co., Ltd.; and Shell Oil Co. of Canada, Ltd.—in arranging oil deliveries through the completion of Trans-Northern Pipe Line, commonly called the "refined products line."

This line transports by-products from the refineries of the three producers at Montreal East to Toronto, a distance of 442 miles, with spurs to Ottawa and Hamilton.

But the companies' tankers formerly used on that route will be diverted to harbors and inlets of shallow depth, not negotiable for the swifter, more economically operated Lake carriers of today's construction.

The Portland, Maine-Montreal-Quebec, pipe line, paralleled now by a lately-opened loop, obviates a lengthy, tortuous and uneconomical extension of the steamship routes out of Gulf, Caribbean and West Coast South American crude sources via Atlantic coastal waters northward from Portland.

No survey of the tanker status on either Canada's Atlantic coast or on her northern littoral of the Great Lakes Basin can be registered without consideration of the Greater St. Lawrence Seaway development. According to authoritative engineering estimates, at least five years would be required for completion of the Seaway project. However, U. S. government, has not followed Canada in approving a mutual seaway development program.

Therefore, no set policy can be determined for oil tanker operation in the Great Lakes region pending a definite decision on the Seaway.

Indications point to one new basic and dependable cargo item for merchant shipping plying the Seaway and Great Lakes. That is the ultimate product of high grade ore deposits in the Burnt Creek and Knob Lake areas of Labrador at a rate graduating from 10 million tons annually over a 40-year period emanating from the 360-mile railway connecting Knob Lake with Seven Islands, Quebec.

Final destiny of the ore will be smelting and steel processing centers of Hamilton and Windsor, Ontario; Youngstown and Cleveland, Ohio; Detroit, Michigan; Gary, Indiana, and Chicago, Illinois, and Milwaukee, Wisconsin.

That anticipated traffic will be supplemented by heavy demands for bunker fuel oils for ore ships and trains bringing ore to tidewater at Seven Islands, the heavy mechanical plants and motorized transport at mine sites, as well as for air traffic centering at Seven Islands. Tankers will largely be used to deliver fuel oils and lubricants to Montreal East, which until recently was almost entirely supplied by rail and air service.

Big Markets. In addition, immense

KEEPING BUSY are the tankers B. A. Peerless and Texaco Chief. The Peerless is unloading at Clarkson refinery. McColl-Frontenac Oil Company's Texaco Chief has a capacity of 28,000 barrels, gross tonnage of 2500 tons and dead weight tonnage on full loaded draft of 3925 tons.

grain deliveries from off the rails to the elevators of such world shipping points as Port Arthur and Fort William, Ontario, and Duluth, Minnesota, and other lakehead centers, spell colossal markets for fuels and lubricants. Bunkers required will be for diesel locomotives and the "armadas" that will move the grain "down lakeward," gasoline and products for elevator use and to satisfy requirements of vitally important contributing industries.

As such marine gateways as St. John, New Brunswick, and Halifax, Nova Scotia, major winter ports of clearance for Europe and the Atlantic seaboard of the Americas, storage elevators are not comparable in size and capacity with those at the lakehead. Nevertheless, they require fuel for vehicles and motors, lubricants for machinery. And at the ports in "the Maritimes," as at Montreal and Quebec city, tankers represent a constant demand for bunker fuel cargoes.

Expectations are that operations in both directions, restricted by current dimensional limits of canals west of Montreal, will develop much vaster proportions should the Seaway be opened. That would include an already established traffic between Montreal and St. Lawrence "downriver" ports and Great Lakes centers, as well as between the latter and Vancouver and Victoria, British Columbia, via both east and west coasts of this continent and the Panama Canal.

The maritime industry of Canada is awaiting with interest any decision on the Seaway because:

- More economical operation by huge tankers would be made possible by the infinite greater capacity of a canalized St. Lawrence.
- All-water tanker movement into the Great Lakes from the Middle East and, eventually, that of refined products in all directions, coastwise and overseas, from Canadian and U. S. Great Lakes refinery centers would be greatly facilitated.

No better barometer of the tanker's future status on the Great Lakes could be had than recent commitments of petroleum refiners in the building of carriers and pipe line terminal dock installation and maintenance.

Examples are the Imperial Leduc and Imperial Redwater (Imperial Oil Limited), both tankers of record dimensions, and the 620-foot, 18,418-ton "B. A. Peerless" (British American Oil Co., Ltd.) which have been launched within the past two years. Additionally, a huge dock was included in the new refinery layout of Canadian oil companies at Sarnia to permit speedy simultaneous loading and unloading.

On both the Great Lakes and the high seas, yet another sure indication of tanker solvency is revealed in the currently tight position of the tanker charter market.

Official returns of the absorption of short term tanker mortgage bonds by chartered Canadian banks and of long-term commitments by Canadian life insurance companies, investment houses and the state-maintained Industrial Development Bank disclose an attractive market in both the U. S. and Canada for "tanker mortgages" under the charters' "lease-back"-to-original-owners principle required by Dominion law and stock market regulations.

While the small tankers of McColl-Frontenac, British American and Shell of Canada have skeletonized their operations between Montreal East and intermediate Lake ports to Toronto, Imperial Oil and others are continuing to utilize existing canal systems.

Though passage through the easterly canals chain between Montreal and Lake Ontario presents navigational drawbacks and difficulties, such as constantly repeated full stop, with lines out, along each lock interval, the waterways still afford routes to the Lakes. And as a transportation medium under any war threat, they are strategically valuable.

Canada's Welland and Sault Ste. Marie canals, of 23-foot and 18-foot, 3-inch normal draft, respectively, are of world renown to mariners and engineers. Welland's twin "locks in flight," Numbers 4, 5 and 6, have a much greater individual and aggregate lift than those of the Panama Canal at Gatun. However, both are narrower and shorter and have less draft.

But the limiting locks on the easterly stretch of waterways between Montreal and the entrance to Lake Ontario (229 miles) restrict to 14-foot draft and 225-foot length tankers entering upon the 1215-mile voyage to the Superior lakehead. —**The End.**

New Germany Pipe Line, Pump Station to Be Used

Completion of a 5-inch pipe line under construction by Emsland-Erdoelleitung GmbH. from the central pump station of Osterwald, near Georgsdorf, to the new refinery at Lingen-Holthausen (Emsland) was scheduled. This pipe line is insulated above ground and will be 13.7 miles in length.

The Osterwald pump station also was nearing completion. It will contain three three-piston pressure pumps with a capacity of 4240 barrels daily and storage facilities for 132,085 barrels of oil. The pump station is scheduled to transport crude from Emlichheim, Georgsdorf, Ruehlertwist, and Scheerhorn fields to the Lingen-Holthausen refinery.

In 1950, Emsland-Erdoelleitung GmbH. had laid a pipe line from Ruehlertwist to Osterwald, a distance of 10.6 miles, and in 1951 built a 1.9-mile pipe line from Scheerhorn to Osterwald. In 1952, the company also began laying pipe lines for natural gas.

During the past year, the company completed a 9.3-mile gas line from Frenswegen to the Georgsdorf and Scheerhorn oil fields. This line is used to transport high pressure gas for repressuring purposes.

Additional pipe lines are scheduled from the Itterbeck natural gas field to the nearby Frenswegen oil field—a distance of 6.8 miles — and from Frenswegen to Bentheim—a distance of 11.8 miles.

Northwest Germany Region Active Exploration Area

The Association of German Crude Producers said in its recently published annual report that 40 geophysical exploration crews had been working in Northwest Germany, on the Upper Rhine, and in the Forelands of the Alps during 1952.

These parties carried out reflexion-seismic and gravity surveys. On the basis of data obtained by 146 drilling rigs, a total of 446 deep wells and a large number of shallow core holes were drilled, 311 of which found either gas or oil.

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What's Happening

AMONG WORLD OIL MEN

INTERNATIONAL GUESTS at a recent meeting of the Los Angeles Chapter of NOMADS (standing): Lep P. Le Bron, Kerr-McGee Oil Industries, Alaska; Roy K. Hautzinger, Baker Transworld, Canada; M. C. Womach, Kerr-McGee Oil Industries, Alaska; Marion C. Williams of Gulf Kuwait Company, Kuwait; P. K. Ozinga, ex-Shell Oil Company, Venezuela. Seated are Hans G. Goethe, Deutsche Erdoel AG., Germany; Sir Robert H. Hadow, British consul general; Major C. Mott-Radclyffe, Member of Parliament, England; R. T. Myers, United Overseas Petroleum Company.

H. G. BAGNALL, former assistant general manager and production manager for Anglo-Canadian Oil Company, has been named general manager of the company.

Bagnall was graduated from the University of Alberta in 1938. After a year as field engineer at Turner Valley for the Alberta Petroleum and Natural Gas Conservation Board, he joined Anglo-Canadian in 1939. He spent three years in Trinidad with Trinidad Leaseholds Limited and returned to Anglo-Canadian in 1943 as production superintendent.

•

E. J. GALLAGHER, superintendent of operations, Tulsa division, Gulf Oil Corporation, has been made manager of the production division in the Canadian district and R. P. LOCKWOOD, exploration manager at Calgary, has been appointed special assignments advisor to the general manager and will be responsible for land trading. R. J. COPELAND has been named geophysical supervisor.

LIONEL V. CHARLESWORTH has been appointed an assistant comptroller of International Petroleum Company, Limited. Charlesworth was born in Toronto, Canada, in 1906, and joined International Petroleum Company, Limited, in 1926 as a junior accountant, based in Peru. Since then, most of his service has been with International's field operations in Colombia and Peru. He was manager of accounting of Colombian operations from June, 1944 to July, 1949, and of Peruvian operations from July, 1949, to January, 1952, when he returned to International's executive offices in Coral Gables, Fla.

L. V. Charlesworth

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THOM H. GREEN, former division geologist for Sunray Oil Corporation, has resigned to be chief geologist for the Fargo Oil Company, Calgary, Alberta, Canada.

Green had been associated with Sunray since 1948 and was formerly Sunray district geologist at Oklahoma City. He was previously with Shell Oil Company as geologist and geophysicist.

•

JOSEPH U. STREETER, formerly petroleum advisor to The Canadian Bank of Commerce, Calgary, has joined the firm of Cleary-Streeter Oil Management, Ltd., as general manager. Headquarters are in Calgary.

J. U. Streeter

In addition to writing various articles on Canadian oil and gas developments, Streeter is a member of the American Association of Petroleum Geologists and the Technical Advisory and Program Committee, Canadian Institute of Mining and Metallurgy (Petroleum and Natural Gas Division).

•

N. E. BAKER, chief geologist of Iraq Petroleum Company since 1935, has been appointed geological consultant to the company and has been succeeded in his former position by F. E. WELLINGS. The latter has been deputy chief geologist of the company.

Prior to joining I.P.C. in 1935, Baker had been associated with Standard Oil Company (N. J.) as assistant to the chief geologist for 12 years. During this time he handled several geological assignments mostly connected with the company's operations in South America.

Wellings entered the oil business in 1921 as a geologist for the Royal Dutch Shell affiliate in Mexico. He joined I.P.C. in 1929 as senior geologist at Kirkuk, Iraq. He has conducted exploration in Syria, Lebanon and Cyprus.

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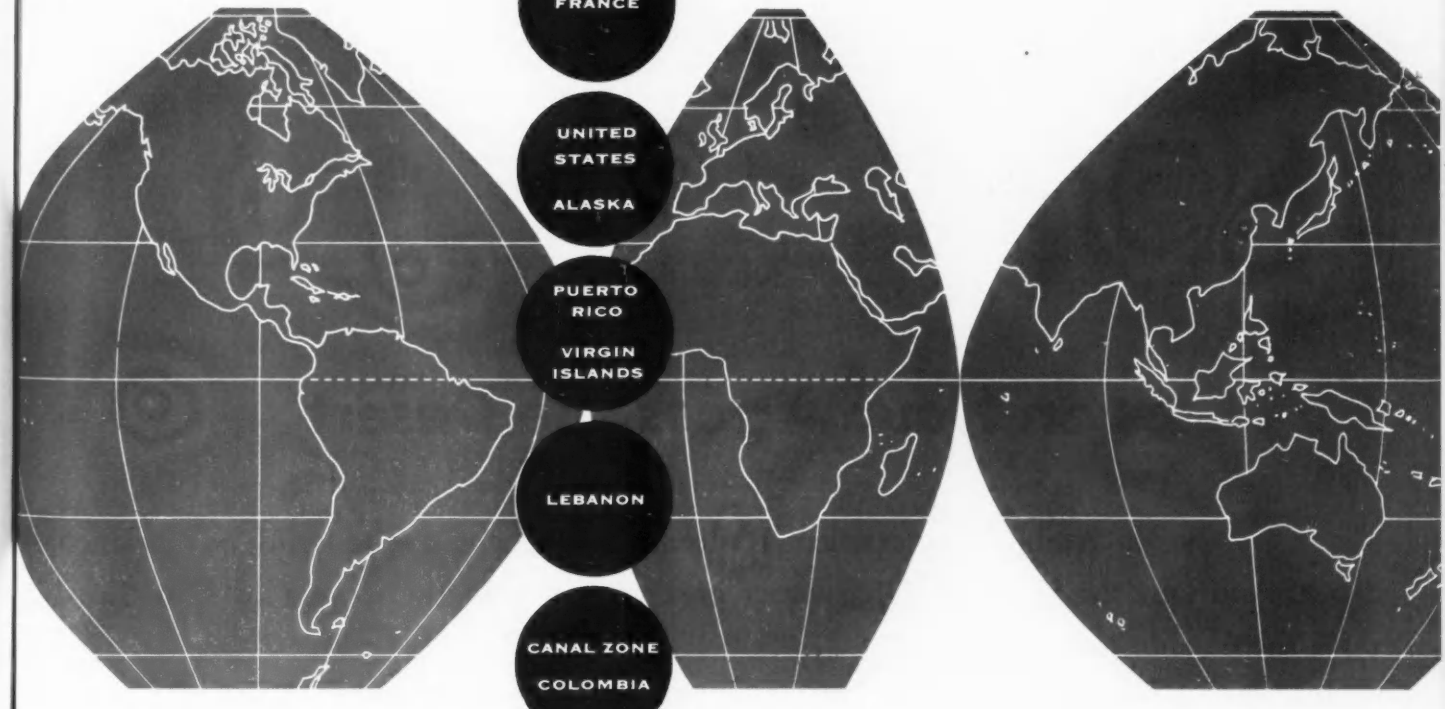

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EAST AND WEST MEET IN THE DESERT. Pride of the operating stock of the Saudi Arabian Government Railroad are three self-propelled, air-conditioned, stainless steel carriers like this one. Each one represents a $145,000 investment. They glide across the sandy wastes at 90 miles an hour in comparison with the four miles an hour registered by the plodding camels.

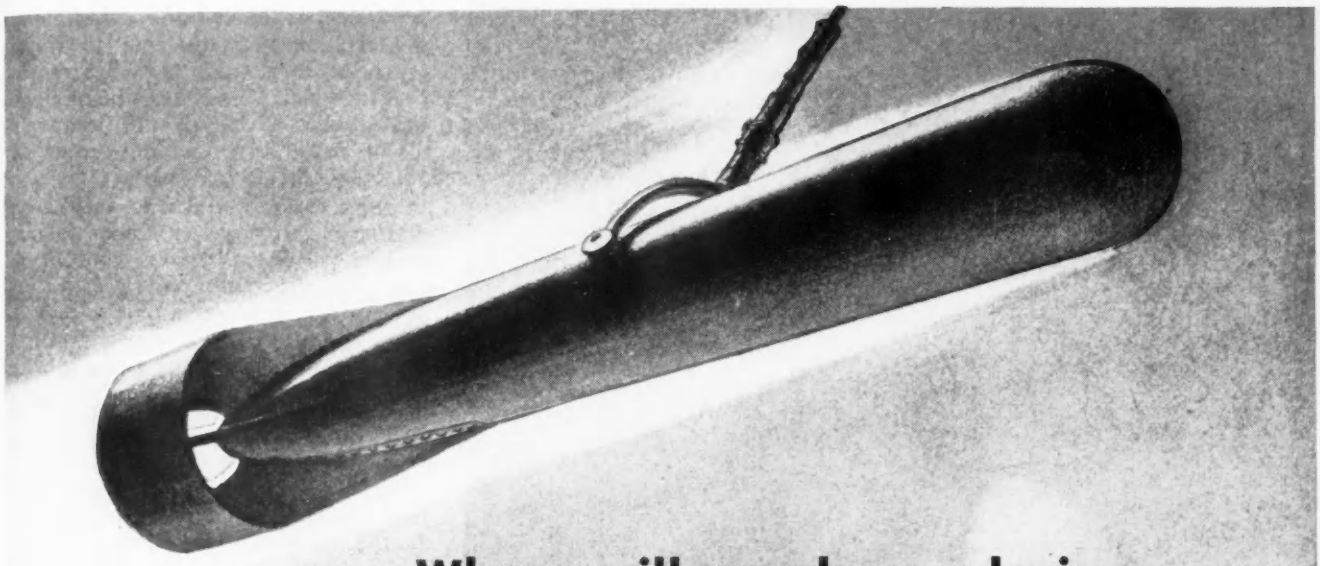
90 Miles an Hour Across the Desert

Saudi Arabian Government Railroad was a tough one to build, but Aramco did it. And now the line and a deepwater port project link the desert of Ibn Saud with the outside world.

MOHAMMED leaned out a cab window of the 1000 horsepower diesel locomotive, and received the go-ahead from his conductor at the far end of the train. The wind whipped his flowing ghuttra as he slowly set the train into motion. The green locomotive with white chevrons blazoned across its bows pointed westward, across expanses of rolling sand towards the ancient walled city of Riyadh, the capital of the desert kingdom of Saudi Arabia.

Mohammed is an engineer on the Saudi Government Railroad, completed to Riyadh in 1951. As a typical Saudi operational employe, Mohammed has discarded some of his flowing garments for more practical khaki trousers and shirts. He still retains the flowing head-dress which provides useful protection against the sun and biting desert sandstorms.

The Saudi Government Railroad is one of the most unusual in the world, in addition to being one of the new-



Where will you be exploring five years from now?

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TRESTLE AND ROCK-FILL causeway connect the pier to mainland at Dammam, a rapidly-expanding city which is the railroad's eastern terminus. The trestle and causeway extend seven miles into the Persian Gulf over shallow coastal flats to 40 feet of water, where ocean draft vessels can easily berth.

est. Actually it's a railroad and deep-water port project, linking the desert capital of Ibn Saud with the outer world. Its route passes through barren gravel plains, loose and shifting sand dunes and salty marshland.

SAG Railroad has a symbolical significance, too. It stands for King Ibn Saud's determination to improve the lot of his people, who for untold centuries have eked a marginal existence out of this hot, arid land. The railroad was built with the assistance of Arabian American Oil Company engineers in the field, and is being paid for out of oil royalties by the Saudi Government.

In the days before the railroad there were three ways to get to Riyadh from the Persian Gulf Coast—by airplane if you were rich enough, by a rough two-day truck or automobile trip if you could afford it, or by camel. Camel speeds average around four miles an hour at best, and their peculiar gait does not afford the most comfortable ride. For the majority of Saudis, however, it was the only economical way to travel, before the railroad was built.

As it's operating now, the Saudi Government Railroad is a 358-mile single track, standard gauge line running through most of the oil facilities and major population centers in the eastern province, the area of Saudi Arabia which borders on the Persian Gulf. The $50 million project took four years to build, and begins in 40-odd feet of Persian Gulf water, seven miles from the flat coastline of Saudi Arabia. A trestle and rock fill causeway connect the pier to the mainland at Dammam, a rapidly-expanding city that is the railroad's headquarters. Next stop on the line is the Aramco headquarters town of Dhahran, then on to the oil production center of Abqaiq and the ancient walled city of Hofuf, the country's major oasis, a population center of 150,000-200,000 persons. It passes through two more oil field areas, the Aramco-supervised Al Kharj farms, and on into Riyadh.

For 53¼ Saudi riyals, or approximately $15, the 358-mile trip can be made in nine hours aboard an air-conditioned, self-propelled car. A free lunch is included in the price of the ticket.

Despite the barrenness of the land, the newcomer to Saudi Arabia will find lots to see on the trip to Riyadh. In the populated coastal areas along the gulf, there are the Saudi oasis towns, the oil operations, and an unusual rocky terrain. Inland, this changes to salt marshland, and then to shifting yellow sands. Spectacular out-croppings of rock appear more and more frequently as the train pushes south and then west. About two-thirds of the way along the red sands of the Dahana are reached. Before entering Riyadh, the train parallels a majestic rock escarpment for miles.

Traveling in Saudi Arabia, like living there, isn't always as pleasant as could be desired. In the summer, there's always the blinding heat. Temperatures of more than 100 degrees are not unusual. On the humid coast every degree is felt, but inland the dry desert wind is cooling.

The Saudi Government Railroad project, long desired by the king, was started in 1946 as Aramco's post-war expansion got into full stride. The king had long felt the over-all need for low-cost, regular transportation all the way into the interior. There were some in Aramco that felt an adequate highway, serviced by a large-scale trucking operation, was the answer. Ibn Saud, however, insisted that a railroad was needed. A competent group of independent engineers surveyed the situation and decided he was right. So, in late 1946 planning started on this vast operation.

From the very start of the government's participation in the project, it was understood that a railroad organization separate and distinct from Aramco would be set up. In line with this, a veteran U. S. railroad man, J. H. Gildea, was recruited in late 1947 to handle the job. A former Union Pacific Railroad man, Gildea spent many of the war years as a Transportation Corps officer, run-

ning the Iranian railroad that was supplying Russia through her back door. Gildea recruited a companion of his Iranian days, M. M. Shappell, to take the post of assistant manager.

Even before the first railroad men were recruited, Aramco's New York and Rome offices were placing orders for construction and operation equipment. Nine months to a year were required for orders to be placed, processed and shipped to Saudi Arabia from the U. S. under normal circumstances, and the entire operation was one of thinking in terms of needs a year in advance. This applied to toothpaste as well as diesel locomotives. Everything had to be imported. For Aramco engineers, accustomed to life 8000 miles from New York, this was an old problem.

Job Begins. On October 11, 1947, bulldozers, graders, and earth movers moved into position at the site of the start of construction operations. The first work was done a little ways inland from the site where the rock causeway was scheduled to begin, and where a Wye now leads north to Dammam and south to Dhahran.

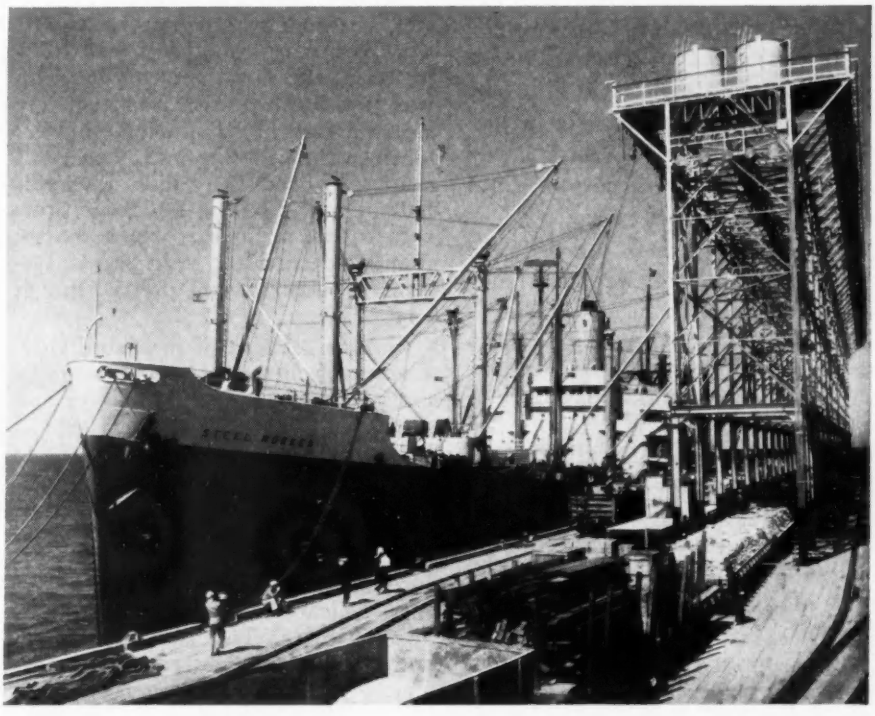
Aramco engineers and International Bechtel, Inc., construction men who were on the jobsite that hot October day were grim about the prospects. They had 358 miles to go, through sandstorms, blazing sun, treacherous marshes and mountains of moving sand. For workers, they had a group of willing but untrained Saudis, few of whom had ever seen a rail or a tie.

The ten and a half miles between Dammam and Dhahran was the big test of the labor force, and the Saudis passed with flying colors. They had already shown remarkable facility in operating heavy equipment, particularly "cats." They took to pneumatic hammers and track-laying with equal ease.

Construction headaches began in earnest on the 50-mile Dhahran to Abqaiq stretch. First came the sabkha, or salt marshland along the coast. Roadbed material had to be hauled in from quarries in this stretch as the crusty surface often would not support the weight of a truck, let alone a railroad track. Equipment often got stuck, slowing down construction. Once a bulldozer sank almost out of sight in the treacherous sands.

Sand dunes began where the sabkha left off. The dunes move from north to south in this area, directly across the east-west track. How to control them was a real problem.

Sand fences were tried first. Improper placement of the first ones built up dunes right in the path of the railroad. Bitter experience taught engineers the most effective use of this tool.



THIS 70-FOOT CARGO TOWER runs most of the Dammam pier's 744 feet. The towering steel work permits the loading of two rows of railroad cars for each ship instead of only the cars adjacent to the ship which can be loaded by the ship's own cargo winches.

It was the oil that financed the railroad that proved the most effective method of controlling the sand. By bulldozing approaching dunes and then spreading a thick coat of Arabian crude on the area, engineers helped control the sand problem. The oil bakes into a hard crust under the intense sun, and the sands blow right across the tracks instead of piling up in dunes. Just as improvisation was at times the only thing that kept construction going, resourceful railroaders rigged up an oil spreader out of a tank car for sand control work.

The roughest was yet to come. About two-thirds of the way to Riyadh, the railhead met the red sands of the Dahana, a 30-mile broad stretch of loose sand piled into high dunes.

Operations went into emergency gear at this point, with a 24-hour workday schedule. Bulldozers pushed the soft sands into fills as high as 29 feet to keep the track level high and clear of dunes. Progress slowed to a crawl, but eventually the jubilant crew broke through. After this, it was relatively clear sailing on the last lap into Riyadh.

Always present as a construction problem was the desert sun. It sapped men's vitality, and turned metal scorching hot. To counteract it, the camp train's living quarters were air-conditioned—an unheard of luxury in the U. S. During the summer months, as much of the work as possible was carried on at night, to save the strain on both workers and equipment.

As the railhead crew slowly pushed inland, construction started on the deep-water port project. The port consists of a two-ship pier and 1.8-mile trestle leading into a small craft pier. From the shallow water pier, a rock causeway runs five miles to the shoreline.

Work started simultaneously from both ends of the pier project. Huge piledrivers rigged on barges drove the first pilings as trucks brought fill to the shoreline from a rock quarry. At first, the crews working on opposite ends of the port were so far apart that it was in fact two distinct operations. It was more convenient for the deep water crews to live at the refinery town of Ras Tanura, which is situated on a sand spit jutting out into the Gulf. They ferried across eight miles of water to the jobsite every day, and the causeway crews drove slightly farther to Dhahran quarters.

According to the IBI, the Dam-

mam pier piledriving was the toughest job they'd ever tackled. Although a series of test piles went into the Persian Gulf floor easily the actual driving operation 100 yeards away was plagued from the start by coral beds up to four feet thick.

Problems like these harried the port-builders all the way, but they were determined to meet the March 15, 1950, operational deadline. When it arrived, the pier was still in a semi-finished state, but the S. S. Lissekerk unloaded. Construction hands turned stevedores to help unload her, old tires were hung over the pier sides in place of the as-yet-unplaced white oak stripping, and train speeds and loads were cut way down because most of the pier's bracing wasn't placed.

Aided by a 70-foot high cargo tower that runs most of its 744 feet, the pier is operating well above the unloading rate for which it was designed. The spiny steel tower permits the loading of two rows of railroad cars for each ship, instead of just the adjacent track which ships' cargo winches can handle by themselves.

In October, 1951, rail construction was completed two months ahead of schedule to the capital city of Riyadh. The government staged a remarkable celebration to commemorate the occasion and to see the arrival of the first train into the city.

The royal tent was set up near the site of the planned Riyadh station, and near where King Ibn Saud and a small group of followers met to plan the recapture of Riyadh just half a century previous. Manager Gildea, dressed in whites, knelt on luxurious oriental carpets beside the throne of the king, explaining the railroad operations as the train arrived, switched cars, and discharged cargo.

"Truly Allah is great," the king exclaimed in an emotion-filled voice.

Sand and Heat. Rail operations are carried on with 17 diesel locomotives, ranging from 150 to 1500 horsepower, and more than 500 pieces of passenger and freight rolling stock. The same two problems—sand and heat—are headaches for the trainmen as they were for the construction crews.

The fine desert sand sifts into almost every moving part used on the railroad, causing high equipment deterioration rates. Despite sand control, it also flows across the tracks, with drifts up to three feet thick forming in 24 hours. Ingenuity solved this problem while railroaders were sweating out the months-long interval between the ordering and delivery of sand spreaders. They took a regular flatcar, and rigged a bulldozer prow to it with a pneumatic winch control that attached to the train's brake system. It wasn't very pretty, but it worked.

Various sections of the Saudi Government Railroad were put into operation as they were completed, and the first operating equipment arrived before the port was completed. It was shipped broken down, and lightered in to shore. An open-air assembly line was set up under the blazing sun, and it took five months to get the first five locomotives assembled. Crews assembled delicate instruments in a 6 by 15-foot crate. The railroad's first storehouse was a converted dynamite shack. Other temporary buildings went up as fast as wood was salvaged from the crates in which the supplies arrived.

Conditions are considerably better now, and will improve still more when diesel and car repair shops now on order in Italy arrive in the field.

The pride of the operating stock are the three self-propelled cars, each one a $145,000 investment. These air-conditioned, stainless steel diesel units travel at speeds up to 90 miles an hour. Other passenger stock consists of 25 former New York, New Haven and Hartford Railroad passenger cars of the commuter type.

SGRR's communications system is entirely automatic dial VHF radio-telephones. Each locomotive is equipped with a radio-telephone, and can communicate with any other locomotive or station on the line.

The railroad now stretches somewhat less than halfway across the heart of the Arabian peninsula. In addition to facilitating the development of Saudi Arabia's oil fields, it has already proved a stimulus to industry and commerce in this re-awakening land. Ever-increasing demands for foreign goods, oil products, foods and construction materials in the interior are being met by the railroad. Travel has been brought within reach of the average man's pocketbook, and the farmer, artisan and merchant profit from an expanding market. In both cargo and passenger loads, the railroad has exceeded all estimates.

—The End.

McMurray Oil Output In 5 to 10 Years Expected

Commercial oil production from the fabulously rich McMurray oil sands of northern Alberta is possible in five to ten years, in the opinion of Dr. Karl A. Clark, professor of metallurgy at the University of Alberta.

Dr. Clark, a leading authority on the untapped oil sands, said that five years "would be a rush job." Ten years, he believed, would be "a sensible, reasonable time."

The Alberta Department of Mines and Minerals predicted that the most intensive prospecting program in the history of the oil sands will take place as drilling rigs and core-testing equipment are brought into action.

Economic development of the McMurray oil deposits is deemed commercially feasible. But the cost of setting up an extraction plant is estimated at around $50 million.

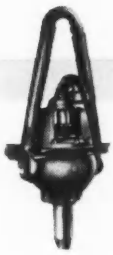
"Those major oil companies are not up there just for their health," Dr. Clark said. "They mean business. They do not want to be left out of the oil sands development, but they do not want to see that development come prematurely.

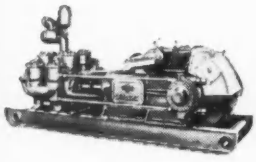
"Without a question of doubt, these companies are determined to develop the oil sands at the earliest possible date. We are on the right road, and we will stay on it. No one is anxious to rush this thing. Five to ten years would be making good time."

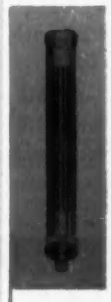
Thirteen prospecting permits have been issued to date in the oil sands region. The thirteen permit-holders are engaged in the second year of a three-year prospecting program. At the same time, research work is being carried out in company laboratories.

Operating jointly on pooled acreage in the McMurray area are Calvan Consolidated Oil and Gas Co. Ltd., Asher Oil Co., Pacific Petroleums Ltd., New Continental Oil Co. Ltd., Charter Oil Co. Ltd., Redwater Utilities Ltd., and Ponder Oils Ltd.

Shell Oil Company and Sun Oil Company hold two prospecting permits each. Rio Tinto Oils Ltd. and Socony-Vacuum Exploration Ltd., are operating independently.







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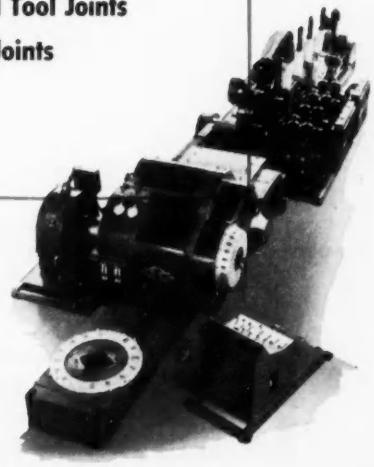

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Higher Production Cuts Canadian Pipe Line Toll

The Edmonton Pipeline Co., operator of the pipe line system serving the Joseph Lake, Armena and Camrose oil fields in central Alberta, has reduced its tariffs. The move thus provides producers in the Viking sand fields with an increase in wellhead gross revenue of more than $13,000 per month.

Lowered oil transport costs have been made possible by increasing production of the fields, and the resultant increasing throughput of the pipe line.

The pipe line company, headquartered in Calgary, is owned by five Calgary independent producers and other Calgary interests. The system includes at present about 62 miles of gathering and transmission lines, storage and pump facilities, connecting the Viking fields with Canada's main oil transmission systems at Edmonton.

About $1.7 million has been invested since the line was started two years ago at Joseph Lake. In recent months services were extended to the new fast growing fields at Armena and Camrose.

ENI May Get Privileged Position in Sicily

The Italian government's Ente Nazionale Idrocarburi appears to be at the eve of obtaining a privileged position in Sicily. Azienda Generale Italiana Petroli has raised the question of research to be carried out in Catania zone, where two successful gas wells were completed by Commendatore Leonardi, and as a result an agency has been formed for the purpose.

The organization is called Mineraria Sicilia Orientale Co., the capital of which belong to AGIP-Mineraria controlled by ENI (70 percent) and Leonardi (30 percent).

In the zone of the first wells a seismic party is at work for the new firm, and ENI has sent some experts to the Societa Nazionale Metanodotti to examine prospects of transporting the natural gas.

In Rome, political quarters say ENI intends to develop its Sicilian activities so as to get control in the various American and British companies which have obtained oil and gas research permits and development concessions from the Sicilian Regional Government at Palermo.

Virden Repressuring Experiment Is Scheduled

California Standard Company which drilled most of the producing oil wells in the Daly field near Virden, Manitoba, is undertaking a $100,000 water pressure experiment in an effort to increase production.

Uniform production of some wells has established presence of a sizable oil reservoir, but the company is seeking more rapid flow. The initial venture will involve injecting water into four wells surrounding a central producer.

If the results are favorable at Virden, the experiments will be extended to other parts of the field. If fully developed to cover the Daly producing area, there would be two producers and two water injection wells to each quarter section.

THE ROYAL'S

"Oil-Bankers" keep up-to-date on the Canadian oil and gas picture

J. C. Mayne, Alberta Supervisor (left) doesn't encourage chair-sitting in the bank's Oil and Gas Department, whose officers make frequent trips into the field.

The officers who staff our Oil and Gas Department are men of varied experience and long training. In their capacity as "oil-bankers," they facilitate and coordinate the many special services called for by oil and gas men. Their knowledge can be of great value to prospective entrants to the field.

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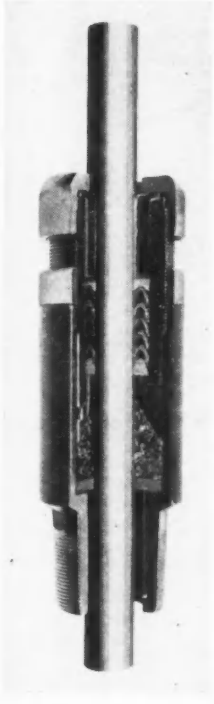
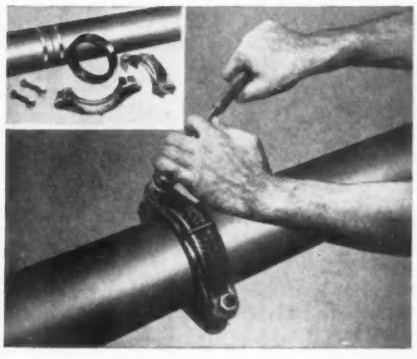
Stuffing Box



A "Dual-Pac" stuffing box that makes it possible to replace the upper (fluid seal) packing without killing the well is now available from the D & B Division, Emsco Manufacturing Company. The packing is sealed on the polished rod by well fluid pressure. The higher the pressure the tighter the seal. The porous bronze gland used in the stuffing box is impregnated with oil. It eliminates contact with all other metal parts, accurately centers the polished rod and reduces wear on the packing. The new stuffing box may be used with a wobbler and is available for use on polished rod liners.

This item supplements Emsco Manufacturing Company, D & B Division, data on page 1374 of Composite Catalog, 19th Edition.

Circle No. 1 on Postcard

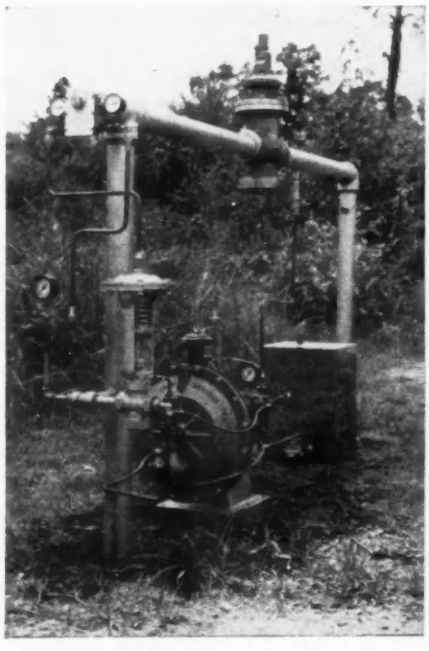


Coupling

The "Gruvajoint" is a new lightweight coupling for grooved pipe systems designed and produced by Gustin-Bacon Manufacturing Company. Gruvajoints are designed to save time, weight, freight and space in coupling grooved pipe systems where pressures do not exceed 500 pounds per square inch. The new couplings automatically absorb expansion and contraction, shock, ground motion and vibration. They remain leakproof under end pulls up to 7500 pounds; permit layout misalignment up to 3 degrees; withstand temperatures between 200° F. and minus 65° F. Gruvajoints can be applied or removed in approximately one minute. They can be used again and again. Gruvajoints are suitable for permanent or temporary lines carrying air, vacuum, gases, water, oil, chemicals and pulverized minerals and rock.

This item supplements Gustin-Bacon Manufacturing Company data on pages 2222-2223 of the Composite Catalog, 19th Edition.

Circle No. 2 on Postcard



Injector Control

The Textroller control hook-up was devised primarily to control the injection of alcohol, methanol and similar anti-freeze solutions into the stream when the temperature of the stream dictated the need for the solution. The Textroller is a temperature operated pilot. The bulb for the pilot is installed into the stream where the control point is to be taken. The range of the Textroller is from 0° F. to 150° F.

The Textroller temperature control point is set five to ten degrees above the hydrate point of the freezing point. When the temperature of the stream falls to a critical point, the Textroller opens and pressure is supplied to the motor valve, and line pressure then actuates the gas operated pump. If the temperature continues to fall, the pilot opens the motor valve further and allows the pump to operate faster, thus injecting more anti-freeze. When the temperature of the stream rises above the set temperature point, the pilot closes the motor valve, stops the pump and ceases to inject anti-freeze.

This item supplements Texsteam Corporation data on pages 694-701 of the Composite Catalog, 19th Edition.

Circle No. 3 on Postcard

Sucker Rod Attachment

Page Oil Tools, Inc. has announced the availability of a new Page sucker rod attachment. This new tool assures quick and easy connection or disconnection of sucker rods at the pump. It provides for easy removal and replacement of sucker rods without distrubing the pump plunger. To operate, run the pump in on the tubing with the lower end of the tool in place. Then lower the rods with the matching ends of the tool attached. When the two sections of the on and off attachment meet, turn right and lower to engage. Turn to the left to lock the two sections together.

Using this tool pumps can be run larger than the size of the tubing and broken sucker rods can be fished without unseating the pump or dumping the fluid. Both the spear and socket sections of this tool are milled with nine extra-heavy lugs to support the load and to assure long life. The bottom photograph shows the spear section and the socket section is at top.

This item supplements Page Oil Tools Inc. data on pages 4115-4126 of the Composite Catalog, 19th Edition.

Circle No. 4 on Postcard

Save time! Keep informed! Circle numbers on postcard, page 291

Rotary Hose

An improved type of rotary hose has been announced by Raybestos-Manhattan, Inc., Manhattan Rubber Division, to withstand 5000 pounds test pressure. It is known as Ray-Man CBL rotary hose and is made with a special cable wire insertion. Features claimed after field tests are extreme flexibility and strength with a high factor of safety. The product also has a synthetic oilproof rubber tube for drilling-in with oil or oilbase mud. Another feature is a new built-in streamlined coupling with a "Lip-Lok" leakproof seal.

This item supplements Raybestos-Manhattan, Inc. Manhattan Rubber Division, data on pages 3192-3193 of the Composite Catalog, 19th Edition.

Circle No. 5 on Postcard

Valve Cover Plate

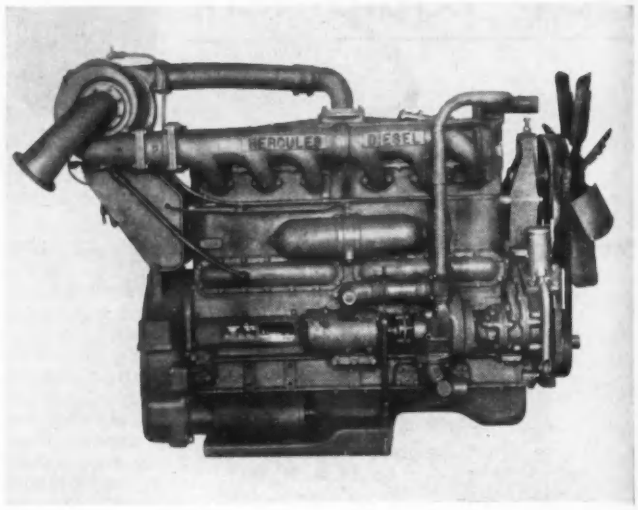
A new removable valve cover plate for slush pumps has been announced by The National Supply Company. Known as the Type QR, the new plates are available for Ideal Type E-700, E-500, C-350 and S-935 slush pumps. They are interchangeable with the old covers with no modification of the fluid end required except on Type E-500 pumps already shipped that will require a special adapter flange to raise the air chamber.

An arrangement for hanging the cover plate on the outer ring facilitates easy handling of the cover by the crew. A tell-tale channel on the bottom edge of the outer ring causes any fluid that leaks past the seal to flow out of the valve pot without damaging the threads. This channel also acts as a drain for any fluids that seep into threads or into the hanger hole.

This item supplements the National Supply Company data on pages 3589-3720 of the Composite Catalog, 19th Edition.

Circle No. 6 on Postcard

Diesel Engine



Hercules Motors Corporation is producing a turbo-supercharged version of its six-cylinder diesel engine Model DFXE. The new engine has a 5⅝-inch bore by 6-inch stroke and 895 cubic inch piston displacement. The DFXE-TS develops 846 lbs. ft. torque at 1800 rpm and 318 hp at 2000 rpm. The supercharged version fulfills the demand for more horsepower without increasing fan-to-flywheel length. The DFXE-TS is particularly suited to power construction equipment, oil field machinery, mining equipment and other equipment in the 300 hp class where a compact engine is important.

Among the engineering features are forced feed lubrication by gear pump to all connecting rods, main bearings, piston pins and rocker arm bearings, seven-bearing, counterbalanced, Tocco hardened crankshaft; high alloy steel valves with valve rotators; exhaust driven supercharger; heat-treated aluminum alloy pistons; and full floating piston pins of alloy steel.

This item supplements Hercules Motors Corporation data on page 2369 of Composite Catalog, 19th Edition.

Circle No. 7 on Postcard

Truck Model

The motor truck division of International Harvester Company has placed in production five medium duty models in the R-160 series with liquefied petroleum gas fuel systems. The new series of LPG-powered models ranges in gross vehicle weight from 14,000 to 17,000 pounds. The models are the RP-160, RP-161, RP-162, RP-164 Loadstar for heavy hauling and RP-165 Roadliner for over-the-road tractor service. Engine is the 108 horsepower, valve-in-head International Silver Diamond 240. Forty-three gallon water capacity (approximately 34 gallon LPG) single or dual fuel tanks are available in 130-inch wheelbase models. Single or dual tanks with 43 or 62 gallon water capacity (approximately 34 or 50 gallons LPG) are available in 142, 154 and 172 inch wheelbase models.

This item supplements International Harvester Company data on pages 2633-2636 of the Composite Catalog, 19th Edition.

Circle No. 8 on Postcard

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"WHY DON'T YOU TRY AETNA? YOU'LL BE SURPRISED AT THEIR VERSATILITY"

Yes, Aetna *is* versatile. For 37 years Aetna has been making original equipment bearings and precision parts for the nation's leading manufacturers in the automotive, farm implement and general industrial fields.

From conventional light duty thrust bearings in 1916, Aetna's versatility has grown to include all-type-all-duty ball thrust bearings, roller bearings and vital parts spanning an incredible range of industrial applications.

It's worth remembering—Aetna's diversified usefulness to industry—Aetna's reputation of producing to the stiffest tolerances known to the industry.

If you are having bearing or parts troubles—if you need a more versatile, more dependable supplier, consider Aetna. Your satisfaction is assured by the fact that 80% of our business comes from firms we have served for 20 or more of our 37 years. Write! Just state your problem, send your prints, or ask that a near-by representative drop in. No obligation. Aetna Ball and Roller Bearing Company, 4600 Schubert Avenue, Chicago 39, Illinois.

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BALL AND ROLLER BEARINGS • MISCELLANEOUS PRECISION PARTS

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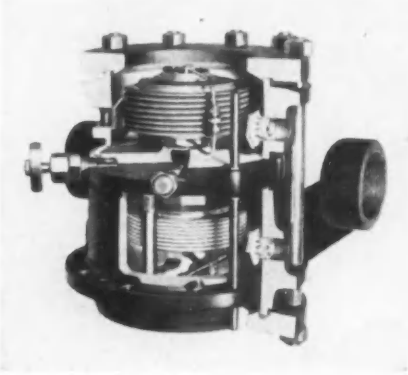
BRANCH OFFICES COAST-TO-COAST: • Albany • Atlanta • Auburn • Baltimore • Binghamton • Birmingham • Boston • Bridgeport • Buffalo • Charlotte • Chicago • Cincinnati • Cleveland • Denver • Detroit • Hartford • Houston • Jacksonville • Los Angeles • Newark • New York • Niagara Falls • Philadelphia • Pittsburgh • Providence • Richmond • Rochester • San Francisco • Seattle • Syracuse • Trenton • Utica • Waterbury • Worcester. *See your classified 'phone directory for addresses.*

Other New Equipment



Orifice Meter

A new metal bellows actuated differential pressure intrument named the Dri-Flo orifice meter has been placed in production by American Meter Company. The new units are offered for applications where accurate measurement is required without the use of a mercury manometer and are specially designed for ease of installation, accurate performance and minimum maintenance. They are adaptable to all American pneumatic controllers, transmitters, differential valves, telemeters and related instruments.

The instrument is a one piece stainless steel bellows construction, and has direct full scale recording pen movement without external gearing or linkage multiplication. The internal working parts are especially accessible for inspection, calibration or cleaning, by removing one or both case cover heads without disturbing manifold piping in any way. Distortion or bellows damage due to sudden over-range is prevented by stick-proof check valves with flat synthetic seats. An additional bellows compensates for volume changes in bellows filling fluid resulting from ambient temperature variations. The instruments operate at working pressures to 1000 psi in differential ranges of 20, 50, 100 and 200 inches, ambient temperatures of minus 25° to 175° F.

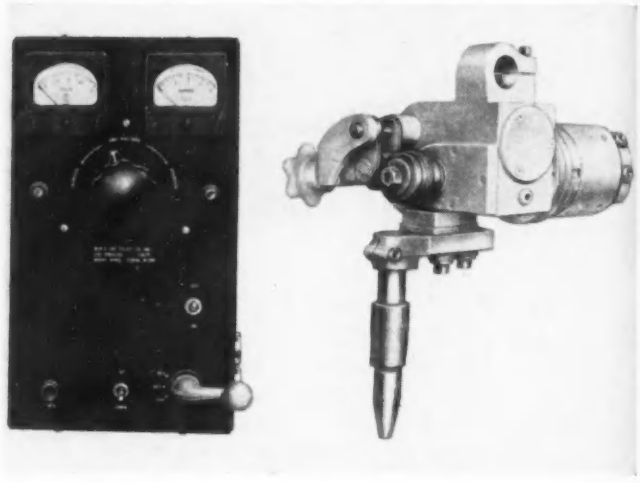
Circle No. 9 on Postcard

Volume Pumps

Milton Roy Company has announced a new pump for submerged operation. Designed especially for handling dangerous fluids, the entire liquid end assembly is submerged in a sump with only the driver and discharge piping exposed. With the pumping cylinder submerged, problems of stuffing box leakage are eliminated. Basically the pump is a variation of the "mini-Pump," and will operate in approximately the same range; capacities up to 3200 milliliters per hour, pressures up to 1000 psi.

Circle No. 10 on Postcard

Welding Head



A new improved Model 944 automatic welding head has been placed on the market by the Mir-O-Col Alloy Company. Control of both welding head and positioner operation is automatic in the 944 as well as the high frequency pilot circuit if one is used. The electro mechanical control circuit is designed to stop both head and positioner automatically if the arc is broken or electrode sticks to the work piece. A control cuts off high frequency unit when arc is established. The motor drive is electrically independent of positioner and welder power supply. The feed rolls on the welding head are of hardened steel and adjustable for both solid and tube wire and they accommodate any rod size from one-eighth inch to one-fourth inch in diameter. Hold down roll has integral tension arm eliminating springs. The feed nozzle is cast from a special Mir-O-Col alloy; operating tests indicate it will outwear ordinary nozzles four to one. Gear train is ball bearing equipped throughout with heavy duty, double row bearings on feed roll shaft.

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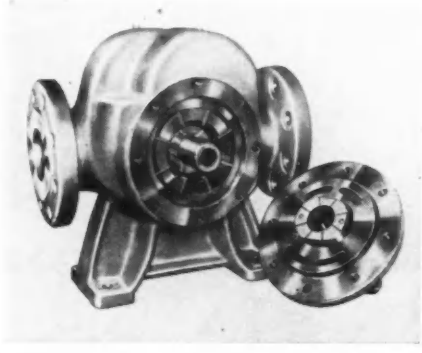

Rotary Pump

A new heavy duty precision-built pump for handling crude oil, refined oil and distillates is being produced by the Marquette Metal Products Co. especially suited to oil field gathering systems and product pipe lines. This is a vane type pump, with a balanced rotor and is available in two-inch, three-inch and six-inch pipe sizes. The pump operates at speeds of 600 to 1200 revolutions per minute. Capacities range up to 850 g.p.m. (1214 g.p.h.) and discharge pressures up to 600 psi.

The Marquette pump provides positive displacement and positive suction and gives a non-pulsating discharge. Rotation and flow are readily reversible. The pump is easily serviced without breaking the line and all parts are standard for quick replacement. Other features include high efficiencies over a wide range of speeds and pressures, inboard ball bearing to absorb drive shaft loads and hydraulic balancing to reduce the load on the main bearing. The pump is built for outdoor all-weather service.

Circle No. 12 on Postcard

Weld Strength Calculator

A weld strength calculator, a companion tool to Lukens Steel Company's plate size selector, has been made available by the company for the convenience of designers, engineers and others interested in steel plate fabrication. The weld strength calculator is a durable plastic slide rule that indicates both the size of weld required for a given applied load and the weight of a given length of weld in pounds. The calculator gives values for stresses ranging from 2000 to 20,000 psi and applied loads of from 9000 to 450,000 pounds. Basic design data for welded connections are graphically shown on the reverse side of the pocket-size calculator and formulas for calculating nominal properties of welded connections are listed.

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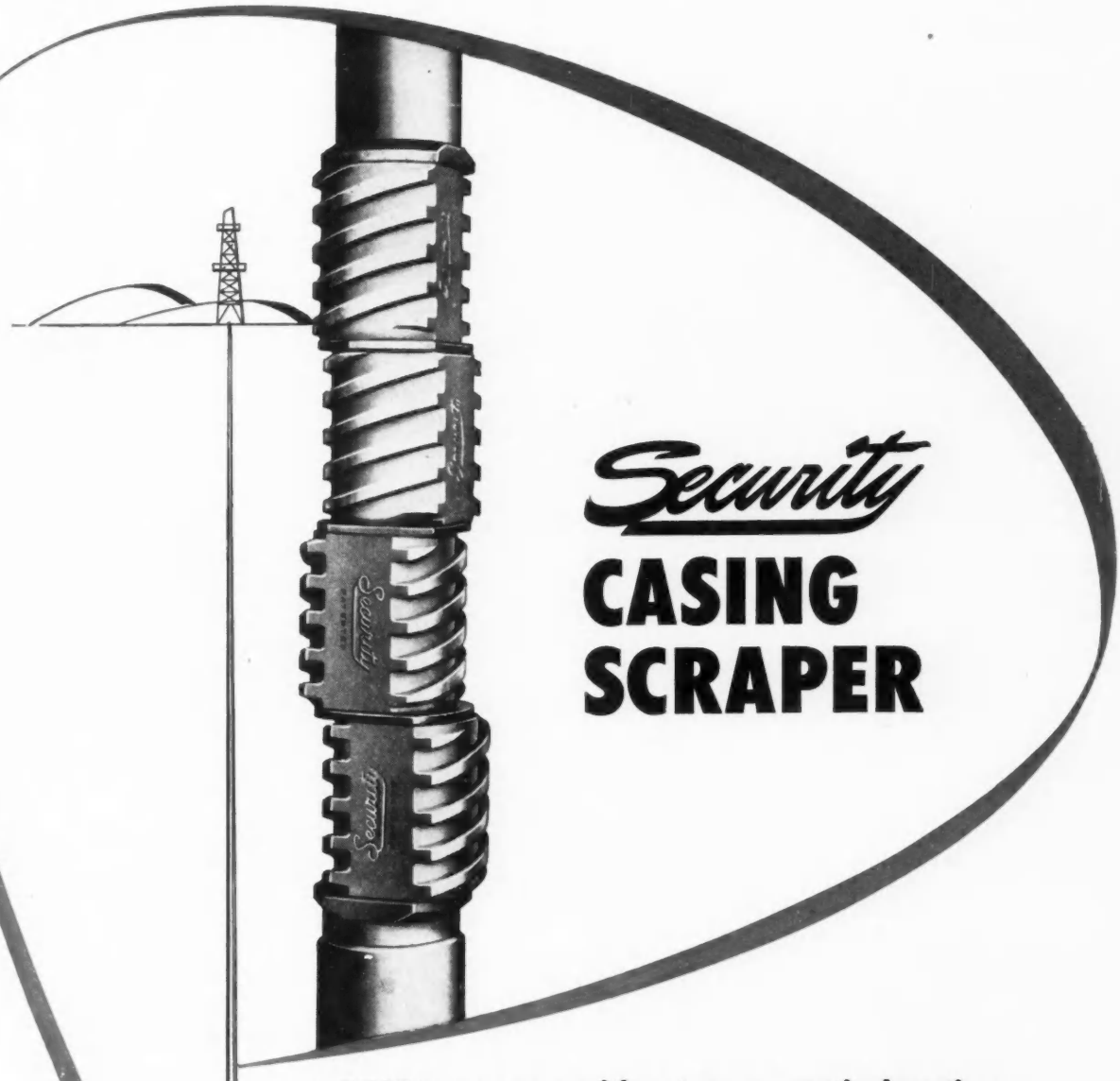

Security CASING SCRAPER

- ***FIRST*** **to operate with rotary or vertical motion while going in or coming out of the hole**
- ***FIRST*** **to cut to exact inside diameter**
- ***FIRST*** **to positively clean every inch of casing**

Cutters of Security Casing Scrapers have helical teeth for positive shearing action and are expanded to full inside diameter by spring pressure. Cutters contact entire casing circumference at all times.

Security Casing Scrapers quickly and easily remove obstructions inside casing – such as scale, gun perforation burrs, or cement sheaths resulting from cementing operations.

Operators everywhere use the Security Casing Scraper as part of their well completion programs.

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DRESSER OPERATIONS, INC.
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BRANCHES IN ALL MAJOR PRODUCING AREAS

ROCK BITS • REAMERS • HOLE OPENERS • CASING SCRAPERS • SECURALOY

512-3

Trenching and Ditching Machine

A new trenching and ditching machine, is being manufactured by the Wagner Iron Works. Designated the Wagner model WT swing trencher, the new hydraulic unit can be converted to a heavy duty loader by the addition of a standard loader dipperstick assembly. The boom has a lateral swing of more than 30 degrees to the right or the left of the trench and a maximum dump height sufficient to load trucks. It is powered by the Independent Wagner hydraulic system and is designed to handle a wide range of bucket sizes and types.

The tool can be used for tree planting, installation of septic tanks, pipe laying and underground electric wiring. Fitting most wheel and crawler tractors, the WT swing trenchers are available for mounting on Ford, Ferguson, John Deere, Oliver, Massy Harris, LeRoi, Case, International Harvester, Allis-Chalmers and Minneapolis-Moline tractors.

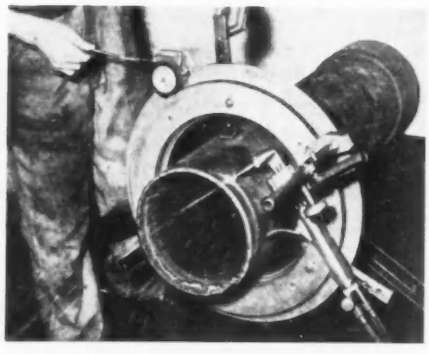
Circle No. 14 on Postcard

Generator

A new heavy duty belt driven generator to do all the power jobs around the home or farm and supply 10,000 watts for many business uses has been announced by Pioneer Gen-E-Motor Corporation. This generator produces 115- and 208-volt single phase and 208-volt three phase power Crank starting is standard but battery starting is available. Remote control can be supplied if desired. This Pioneer 10,000 watt generator will operate motors up to seven horsepower, three phase, five hp single phase capacitor or repulsion start 220-volt and two hp single phase, capacitor or repulsion start 115-volt.

The generator is equipped with voltmeter, field rheostat for controlling voltage, convenient receptacle for up to 2000 watts of 115-volt power. It has a standard outlet box to permit easy connection to leads for full 10 KW output. The generator will provide 10 KW at 208 volts, two phase or 115 volts single phase; 8 KW at 208 volts, single phase if two circuits are used, 6 KW at 208 volts single phase if only one circuit is used. It can be connected through transfer switch to standard wire system.

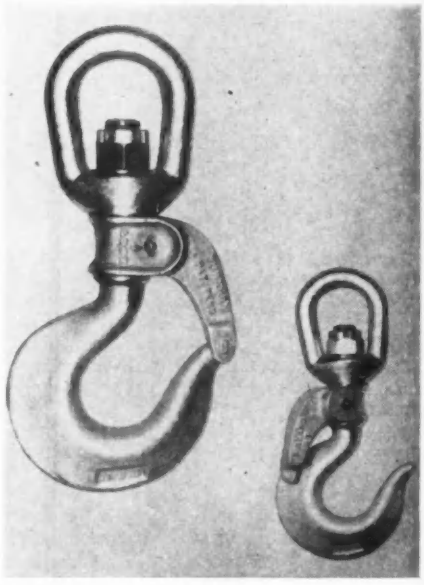
Circle No. 15 on Postcard



Acetylene Cutter

A new acetylene torch cutter which cuts and bevels steel pipe with absolute accuracy in one and a half minutes has been placed on the market by the Springload Mfg. Corp. The new torch cutter has a traveling carriage attachment and clamp which holds the torch in a fixed position in relation to the pipe as it rotates. The machine is designed to keep the torch at a proper distance and angle and is so mounted on a precision universal chuck that it holds within 1/64-inch of accuracy. A hand-operated crank is used to advance the torch. A one-man tool, the Springload acetylene torch will cut ten-inch pipe in about two minutes with even cut and bevel all around the pipe. Available in two sizes, 4-inch to 12-inch and 12-inch to 20-inch, the tool is obtainable through water and sewage and plumbing supply houses.

Circle No. 16 on Postcard



Safety Hook

A hook with a safety gate which locks automatically and will not open unless the pin is manually depressed is one of the safety features of the new Bullard-Burnham safety hook. The addition of this safety gate to a new hook makes it impossible for the load to slip off. It creates a safety feature that gives added protection to persons in industries in which derricks, hoists and cranes are used.

The new design of the safety gate uses the hook shank as its operating base yet does not obstruct the throat of the hook. The rustproof gate which can be adapted to fit all makes and sizes of standard hooks opens and closes with ease in all types of weather. It swings open horizontally on the shank axle so that even a full load will not snag in loading or unloading operations.

These safety hooks are drop forged steel as supplied by established hook manufacturers. Component parts are cadmium plated. Non-corrosive safety gates are of brass and are available with or without return spring for automatic closing. Rustproof lock pins are of Duronze.

Circle No. 17 on Postcard

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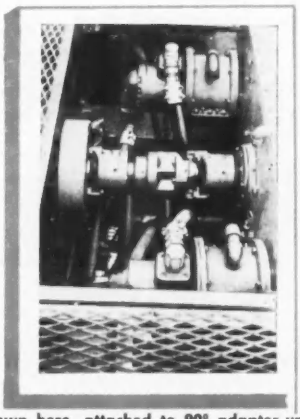
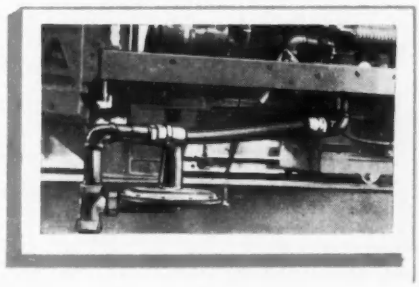
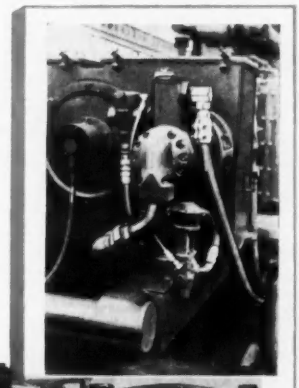


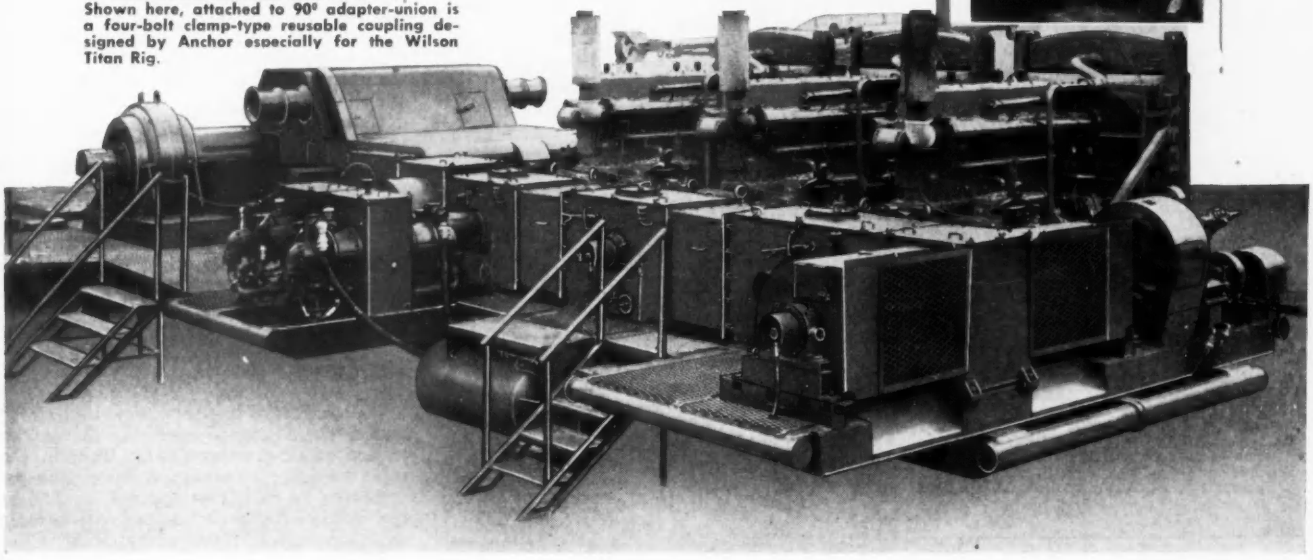
View of Anchor Medium-Low Pressure One-Wire Braid Cotton-Covered Hose and Reusable Couplings.



General view of Anchor hose assemblies on Wilson's all-friction, clutch-drive compound rig.



Shown here, attached to 90° adapter-union is a four-bolt clamp-type reusable coupling designed by Anchor especially for the Wilson Titan Rig.



WILSON uses ANCHOR Hose Assemblies on world's first hydraulic drilling rig

. . . for dependable service under toughest oilfield conditions

Anchor Clamp-Type Reusable Couplings for high-medium pressure one- and two-wire braid hose are widely used on equipment subject to rough going.

Anchor Reusable Couplings for Medium-Low Pressure One-Wire Braid Cotton-Covered Hose. Cutaway section shows positive grip which prevents leaks and blow-offs.

P-7

AS insurance against hydraulic-line failure, this Wilson Titan Rig is equipped with Anchor Clamp-Type Reusable Couplings.

They guard against downtime three ways:

1. They have specially designed clamping segments — impulses can't shake them loose.
2. Field servicing is easy. It takes only two automotive-type wrenches to attach or detach Anchor Clamp-Type Reusable Couplings. Hose cover need not be stripped.
3. There's no waiting for repairs — hose lengths are made up as needed.

The compact design of the Anchor clamp — and the use of streamlined Anchor adapter-unions and related fittings — make a neat installation.

Also used on this rig is the Anchor Two-piece Reusable Coupling for one-wire braid cotton-covered medium-low pressure hose.

See how *you* can use Anchor hose assemblies profitably on high-, medium- and low-pressure applications. Write for catalog 52S.

ANCHOR COUPLING CO. INC.

Main Office and Factory: LIBERTYVILLE, ILLINOIS
FACTORY BRANCHES: DETROIT, MICHIGAN • DALLAS, TEXAS

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If it's action you want, whether your needs are Packings, Piston Rings or Valve Discs for use as original equipment, for routine replacement or when critical conditions require IMMEDIATE SUPPLY, France is 'bustin' out all over' with production and technical facilities to serve you.

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New Catalogs and Equipment Literature

Gas Gravitometers

In a new bulletin just issued by American Recording Chart Co. featuring the complete line of gas gravitometer instruments, the new recording gas gravitometer is featured. This instrument may be used for either recording transmitting or recording controlling. Available upon request, the new bulletin outlines the principle of operation as well as listing pertinent information helpful to engineers and purchasing agents.

Circle No. 18 on Postcard

Orifice Meters

A 28-page bulletin describing Rockwell "201" orifice meters has been issued by Rockwell Manufacturing Company. Featured in the new bulletin are tables giving representative orifice capacities. Construction and operation of the meters are shown. A full page of drawings describe how the meters are used with liquid seal chambers and piping for steam, corrosive gases and liquids. Complete specifications are offered for meter mountings and manifold, straightening vanes, forged steel orifice flange unions and ring-type joints.

Circle No. 19 on Postcard

V-Type Engines

Publication of a bulletin containing construction and operating data on Nordberg four-cycle Supairthermal V-Type stationary or marine engines is announced by Nordberg Manufacturing Company. Nordberg 13-inch bore and 16½-inch stroke engines as described in the bulletin are built to meet needs for a high power, heavy duty diesel, duafuel or spark-fired gas engine of moderate weight and small dimensions. Specifications present the weight and ratings of both the 12 and the 16 cylinder engines which cover a horsepower range from 2400 to 4260 at 450 to 600 rpm.

Circle No. 20 on Postcard

Oil Field Equipment

A new market brochure, "New Performance in the Oil Field" has been released by the Tractor Division of the Allis-Chalmers Manufacturing Company. The brochure shows the various applications of crawler tractors and motor graders with allied attachments and the new rubber-tired motor scrapers recently added to the A-C line, in the oil fields. Action pictures show the equipment digging slush pits, skidding rigs, building and maintaining roads, and performing many other oil field jobs.

Circle No. 21 on Postcard

Dual Purpose Coupling

Literature describing the new dual-purpose coupling-repair clamp is available to persons concerned with pipe engineering and maintenance work. The folder explains application of the device for the coupling or repair of gas, water and petroleum pipe lines. Complete price and specification data are included and the six step method of assembly illustrates simplicity of design, speed of installation, and durability of the components of manufacture.

Circle No. 22 on Postcard

Volume Pumps

Milton Roy Company's new bulletin describes the Milton Roy motor driven controlled volume pumps. This bulletin contains valuable information on design and construction of these pumps and other technical data such as capacity-pressure selection tables; types of capacity adjustments, standard and special designs, as well as packaged systems. A two page chart describes typical applications in six major industries. Also included is a four-page materials selection chart in four colors.

Circle No. 23 on Postcard

Control Unit

A four-page folder illustrating the new Baker power control unit has been released for distribution by The Baker Manufacturing Company. Performance details are given on the completely new design features of the PCU-75's multiple-disc clutch, simplified brakes, adjustable hand levers, and sheave mountings. Full specifications are given.

Circle No. 24 on Postcard

Cast Tooth Sprockets

An abbreviated catalog on Rex cast and steel chain, cast tooth sprockets, belt conveyor idlers and spray nozzles has been released by Chain Belt Company. Intended for designers of equipment using sprocket chains and power transmission machinery, the book has a pictorial index

Circle numbers on postcard, page 291

on the inside front cover. The story of corrosion and abrasion-resistant Rex Z-Metal is presented. Chain listings and prices are given along with sprocket information. Take-ups, buckets, idlers, spray nozzles and chain attachments are also listed.

Circle No. 25 on Postcard

Boiler Baffles

A four-page bulletin showing how streamlined baffles are applied to boilers of all types and sizes has been issued by The Engineer Company. Included in this bulletin are 21 drawings of boilers showing how these baffles are installed in each specific unit to secure cross flow of gases of combustion and tapered gas passes with resultant increase in steam output. Other advantages claimed for these baffle constructions are reduction of eddy currents, elimination of dead gas-pockets and restrictive gas passages that increase draft loss without promoting heat transfer.

Circle No. 26 on Postcard

Pipe Line Pumping

Complete power packages for all pumping needs are featured in Pipe Line Pumping, a new booklet available from Caterpillar Tractor Company. Caterpillar oil field engines running on regular diesel fuel, crude oil and natural gas are pictured in permanent and emergency pumping states scattered from Texas to Ohio. Flexibility of these machines both fuel-wise and move-wise is stressed as in the economy of Caterpillar engines over other power sources.

Circle No. 27 on Postcard

Electronic Weighing

How to weigh the contents of tanks, bins and hoppers electronically with Baldwin SR-4 load cells is explained in a new illustrated brochure issued by Baldwin-Lima-Hamilton Corporation. The bulletin covers installation design considerations such as mountings, temperature effects and vibrations; indicating and recording instruments; weighing accuracy; and Baldwin-Lima-Hamilton's engineering services.

Circle No. 28 on Postcard

Seamless Pipe

Republic Steel announces its entry into the production of oil country seamless casing and tubing in a new catalog titled "Republic Seamless Oil Country Tubular Products." An aerial view of the new plant, a map showing the location in relation to the oil fields, and a pictorial story of the production of seamles casing are given.

Circle No. 29 on Postcard

THE NEWEST, QUICKEST WAY TO MAKE ENDS MEET

the job's a snap . . . with a snap-joint

Here's the newest development in Mechanical Pipe Couplings—the Victaulic Snap-Joint *boltless toggle* pipe coupling.

The Snap-Joint extends the Victaulic Method into usages where speed and frequent dis-assembly and re-assembly are controlling factors. Snap-Joints assemble over the pipe ends in a matter of seconds with a speedy hand-lock . . . no wrenches required.

Snap-Joints, made to supplement Victaulic's famous line of bolted couplings, are ideal for temporary lines, valve, meter and pump connections and similar uses . . . their strength and durability make them completely reliable for permanent installations.

Snap-Joints fit Victaulic grooved pipe and the complete line of Victaulic Pipe Fittings . . . Ells, Tees, Reducers, Caps, etc. Every joint serves as a pipe union.

New Victaulic Snap-Joints are ready for your next job through all Victaulic Stocking Supply Houses. Available in pipe sizes: 1", 1¼", 2", 3" and 4". They are part of the world famous *complete* Victaulic Method of Piping.

Write today for Victaulic Snap-Joint Catalog No. 44-81

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Export: Pipe Couplings, Inc., 30 Rockefeller Plaza, N. Y. 20, N. Y.

Catalogs AND EQUIPMENT *Literature* OFFERED IN THIS ISSUE'S ADVERTISEMENTS

Copies may be obtained easily and without cost by using the Reader Service Postcard on Page 291. Just circle on the card the number at the end of each item in which you are interested.

AERIAL PHOTOGRAPHY—Brochure. Abrams Aerial Survey Corp. See page 272.
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TUBING SPIDER—Bulletin TS54. Advance Oil Tool Co. See page 210.
Circle A3 on postcard.

DIRECT FLOW PUMPS—Catalogs. The Aldrich Pump Co. See page 213.
Circle A8 on postcard.

LIQUID GRAVITOMETER—Bulletin 111-R2. American Recording Chart Co. See page 312.
Circle A13 on postcard.

ROLLER BEARINGS—Catalog. American Roller Bearing Co. See page 37.
Circle A14 on postcard.

HOSE ASSEMBLIES—Catalog 52S. Anchor Coupling Co. See page 299.
Circle B3 on postcard.

CORROSION INHIBITOR—Bulletins. Armour Chemical Division, Armour and Company. See page 215.
Circle B4 on postcard.

PRESSURE WELDING PROCESS—Bulletin. Baash-Ross Tool Co. See page 83.
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EXPLOSION PROOF RADIATOR—Folder. Burnham Corp. See page 331.
Circle C12 on postcard.

HYDRAULIC SUB-SURFACE PUMP—Bulletin. Byron Jackson Co. See page 193.
Circle D1 on postcard.

ROTARY BRUSH CUTTER—Information. E. L. Caldwell & Sons. See page 268.
Circle D3 on postcard.

BLOWOUT PREVENTER—Literature. Cameron Iron Works, Inc. See I Cover.
Circle D4 on postcard.

PLASTIC PIPE—Literature. Carlon Products Corp. See page 31.
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PERFECT SEAL UNIONS—Catalog 11. Catawissa Valve & Fittings Co. See page 322.
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DEPTHOMETER—Bulletin. The Cavins Co. See page 210.
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CHEMICAL, ENGINEERING AND GEOLOGICAL SERVICES—Data. Chemical & Geological Laboratories. See page 340.
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SWIVELL JOINTS—Catalog 53-C. Chiksan Co. See page 323.
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INDUSTRIAL ENGINES—Information. Chrysler Corp. See page 21.
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FORK TRUCKS—Literature. Clark Equipment Co. See page 328.
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PIPE LINE VALVES—Catalog and Circular AD-1864. Crane Co. See page 8.
Circle E14 on postcard.

OIL FIELD ENGINES—Catalog. Detroit Diesel Engine Division. See page 23.
Circle F3 on postcard.

LIFTING JACKS—Bulletin AD 19-C. Duff-Norton Manufacture Co. See page 25.
Circle F6 on postcard.

NEOPRENE NOTEBOOK—E. I. du Pont de Nemours & Co. See page 41.
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PACKINGS, PISTON RINGS AND VALVE DISCS—Information. France Packing Co. See page 300.
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ROCK DRILLS—Bulletin WD-1. Gardner-Denver Co. See page 29.
Circle G5 on postcard.

ATTRACTOMETER—Information. Geophysical Survey Syndicate. See page 338.
Circle G9 on postcard.

CENTRIFUGAL PUMPS—Bulletin No. 7-LW-13. The Gorman-Rupp Co. See page 324.
Circle G11 on postcard.

GATE VALVES—Bulletin No. G-53. Grove Regulator Co. See page 335.
Circle G14 on postcard.

BOOK CATALOG. Gulf Publishing Company. See page 334.
Circle H3 on postcard.

ROD PUMP—Bulletin. Harbison-Fischer Manufacturing Co. See page 212.
Circle H7 on postcard.

WASHOVER BACK-OFF TOOL—Information. Houston Oil Field Material Co. See page 137.
Circle H10 on postcard.

LEASE RENTAL HOUSING—Details. Houston Ready-Cut House Co. See page 268.
Circle H11 on postcard.

BARREL BEARING—Catalog. Hyatt Bearings Division. See page 38.
Circle J3 on postcard.

VERTICAL PUMPS—Bulletins 7209 and 7228. Ingersoll-Rand Co. See page 51.
Circle J5 on postcard.

DUCTILE IRON—List of Publications. International Nickel Co. See page 36.
Circle J7 on postcard.

PUMPING UNITS—Information. Jensen Brothers Manufacturing Co. See page 220.
Circle J9 on postcard.

VALVE LUBRICANT—Details. Jet-Lube, Inc. See page 216.
Circle J10 on postcard.

RELIEF VALVE—Bulletin 11250. Kinzbach Tool Co. See page 311.
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GRAVEL PACK—Information. The Layne and Bowler Co. See page 33.
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PUMPING UNITS—Details. LeGrand, Sutcliff & Gell, Ltd. See page 10.
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CHEMICAL FEEDERS—Information. Manzel Division of Frontier Industries, Inc. See page 218.
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PLUNGERS—Catalog. John N. Martin, Mfr. See page 202.
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"HOW TO GET MORE OIL"—Data. McCullough Tool Co. See page 347.
Circle L14 on postcard.

LIQUID LEVEL CONTROLS—Bulletin 39S. The Mercoid Corp. See page 338.
Circle M3 on postcard.

SAND PUMPS—Price List. Miller Sand Pump Co. See page 322.
Circle M4 on postcard.

STEEL FABRICATION AND DESIGN—Information. Lee C. Moore Corp. See pages 144-145.
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SLUSH PUMPS AND PUMP DRIVES—Bulletins. The National Supply Co. See pages 73-76.
Circle M8 on postcard.

SEAMLESS DRILL PIPE, CASING AND TUBING—Bulletin No. 15. National Tube Division, United States Steel Corp. See page 13.
Circle M10 on postcard.

PUMPS. Information. The New York Air Brake Co. See page 325.
Circle M11 on postcard.

SLUSH PUMP LINERS, LINER PACKING ASSEMBLIES AND LINER PULLERS—Catalogs No. P-120, P-121 and P-122. Oil Well Manufacturing Corp. See page 316.
Circle N1 on postcard.

WEED KILLER—Literature. Pacific Coast Borax Co. See page 200.
Circle N3 on postcard.

PUMP ANCHOR—Information. Page Oil Tools, Inc. See page 182.
Circle N4 on postcard.

OIL THIEF—Literature. Protek Specialty Co. See page 322.
Circle N11 on postcard.

MICROWAVE SYSTEM—Booklet. Radio Corporation of America. See page 259.
Circle N12 on postcard.

DUAL BEARINGS—Information. Regan Forge & Engineering Co. See page 324.
Circle P1 on postcard.

TUBULAR PRODUCTS—Booklet No. Adv.—595. Republic Steel Corp. See pages 332-333.
Circle P3 on postcard.

ORIFICE METERS—Bulletin 1050. Rockwell Manufacturing Co. See pages 255-256.
Circle P8 on postcard.

WELLCHECKERS—Catalog. Rolo Manufacturing Co. See page 336.
Circle P10 on postcard.

BLOWOUT PREVENTER AND STRIPPER—Catalog. Shaffer Tool Works. See page 20.
Circle Q5 on postcard.

PUMPING UNITS—Information. Southern Engine & Pump Co. See page 329.
Circle Q11 on postcard.

PREFABRICATED HOUSES—Information. Southern Mill & Manufacturing Co. See page 313.
Circle Q12 on postcard.

DRILLING AND FISHING TOOLS—Catalog. Spang & Co. See page 320.
Circle Q14 on postcard.

HYDRAULIC JACKS AND PULLERS—Information. Templeton, Kenly & Co. See page 327.
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EMPLOYERS' HANDBOOK—Texas Employers Insurance Assoc. See page 19.
Circle R8 on postcard.

SHALE SEPARATOR AND SHALE SHAKER—Information. Thompson Tool Co. See page 135.
Circle R10 on postcard.

UNIBOLT PIPELINE PRODUCTS—Bulletin PL-510. Thornhill-Craver Co. See page 249.
Circle R11 on postcard.

CORROSION RESISTANT MATERIAL—Data Booklet. Tube-Kote, Inc. See page 330.
Circle S1 on postcard.

WIRE ROPE FOR WELL DRILLING—Handbook. Union Wire Rope Corp. See pages 304-305.
Circle S3 on postcard.

DRAW WORKS—Catalog. Unit Rig & Equipment Co. See page 125.
Circle S4 on postcard.

RETARDED OIL-WELL CEMENT—Bulletin. Universal Atlas Cement Co. See page 56.
Circle S5 on postcard.

ELECTRONIC TANK GAUGE RECEIVER—Bulletin. CP-3004. The Vapor Recovery Systems Co. See page 267.
Circle S6 on postcard.

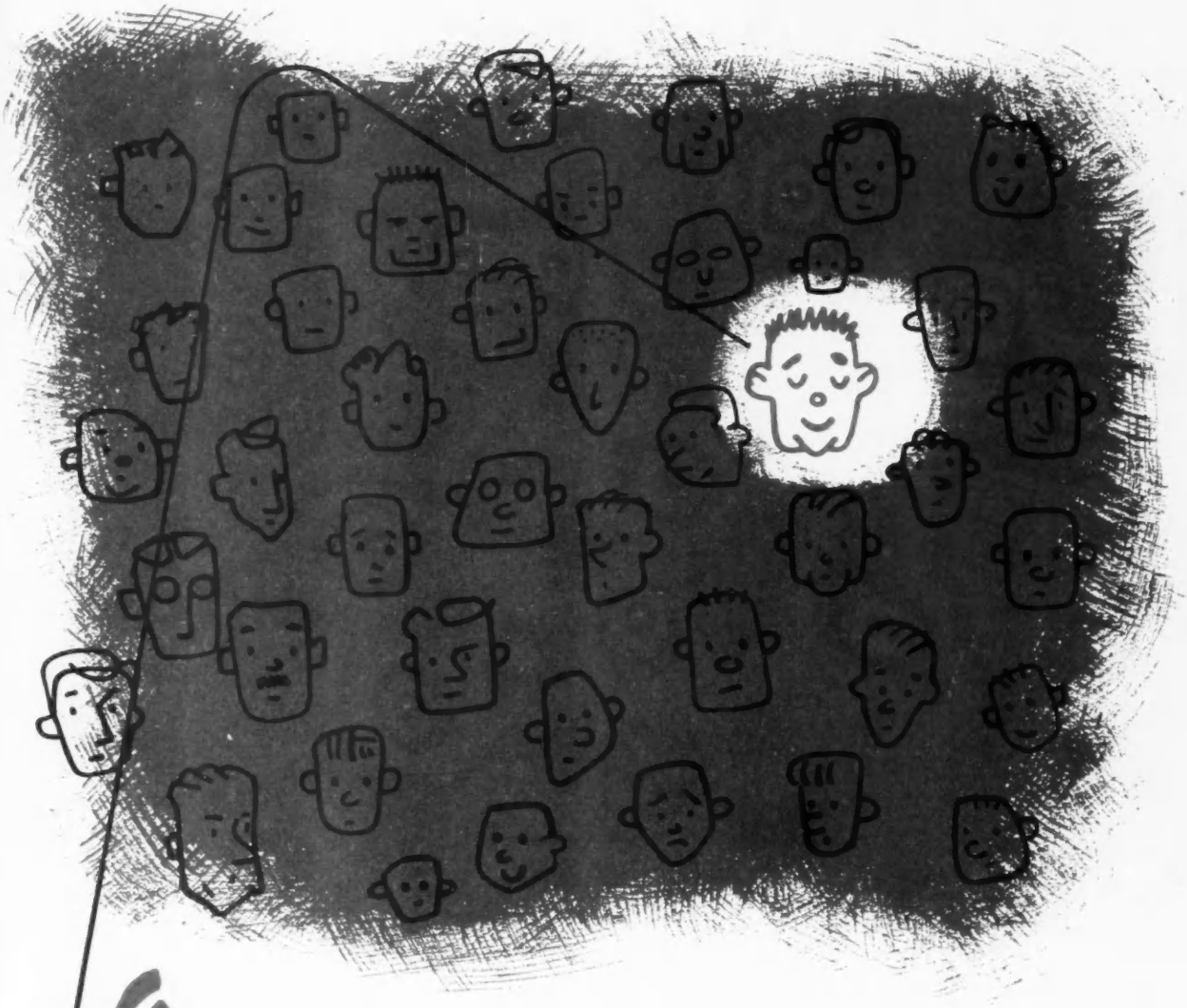
BOLTLESS TOGGLE PIPE COUPLING—Catalog No. 44-81. Victaulic Company of America. See page 301.
Circle S7 on postcard.

GATE VALVES AND LUBRICATED PLUG VALVES—Information. Walworth Co. See page 247.
Circle S11 on postcard.

AIR-TUBE CATHEAD—Details. Wichita Falls Foundry & Machine Co. See page 141.
Circle T3 on postcard.

HIGH PRESSURE PUMP—Information. Wilson Supply Co. See page 30.
Circle T7 on postcard.

ELECTRIC WELD PIPE—Information. Youngstown Sheet & Tube Co. See page 114.
Circle T11 on postcard.



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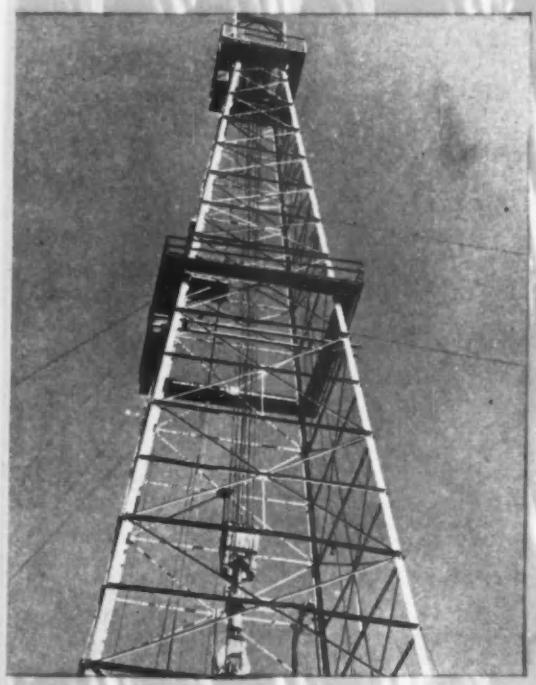

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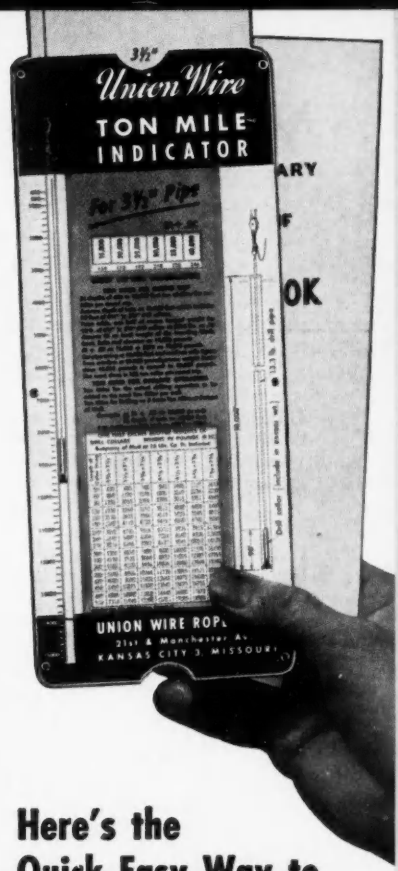

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What's Happening

AMONG MEN IN THE INDUSTRY

G. C. Bell has been promoted to production foreman for Sohio Petroleum Company and transferred from Clay City, Ill., to Morganfield, Ky.

•

Charles Zlomke, assistant production foreman for Cities Service Oil Company, has been transferred from Paul's Valley, Okla., and promoted to foreman at Billings, Mont.

•

Jack E. Haughn, formerly with Dowell Incorporated, has joined Kirkpatrick and McGuire, consulting petroleum engineers, at Shreveport, La. Haughn is a graduate of the University of Texas and while a student, he was employed by Orchem Corporation in special reservoir studies in their laboratory. Haughn will assist **R. S. Waterman** with making special reservoir studies and in field work for primary and secondary recovery operations.

Jack E. Haughn

•

Windsor L. Adkison has joined the Fuels Branch staff of the U. S. Geological Survey at Tulsa to work on oil and gas investigations. A native of Kansas, Adkison has been engaged in coal mapping for the Geological Survey in Kentucky since 1950.

•

J. F. (Duke) Dingee, formerly field superintendent for Sunray Oil Corporation, in the Seminole-Wewoka, Okla. area, has been transferred to Great Bend, Kansas, and promoted to assistant district superintendent of the Kansas production district.

•

Mark Olson, formerly manager of operations for C. J. Brown, Houston independent operator, has opened offices in Rio Grande City, Texas, as a consultant and will specialize in engineering and geological problems in Southwest Texas and Mexico.

•

Lee Ulrey has resigned as geologist for Inland Producers, Inc. at Evansville, Ind., and is now associated with J. D. Turner, Oklahoma City independent operator.

•

Wilmer R. Schirk has resigned as district geologist for Bay Petroleum Corporation in Wichita Falls, Texas, to become an independent operator. Schirk has been succeeded by **Ted Becker,** who was transferred from Oklahoma City.

•

Harry L. Berry has joined Francis Oil and Gas Company, Inc., Tulsa, as landman-geologist.

H. C. King

F. S. Slick

H. C. King, former controller of The Ohio Oil Company, has been elected to the newly established office of financial vice president. **F. S. Slick,** assistant controller, has been appointed controller succeeding King. King joined the company as a clerk in the Production department at Findlay in 1921 and after a series of promotions, he was elected to the board of directors in 1946. Slick began his permanent employment with Ohio Oil as a production accounting clerk at Findlay in 1926. He was named assistant controller in 1941.

•

H. K. Greenleaf has been named general vice president of The Chicago Corporation. Formerly Greenleaf was vice president—exploration. **Ira H. Stein** has been promoted to manager of the Land and Exploration department; **W. E. Cowan,** formerly division landman at Abilene, Texas, has been transferred to Fort Worth and is now superintendent of the Land department. **William D. Young,** formerly assistant landman, replaces **W. E. Cowan** as division landman at Abilene.

•

H. W. Brown has become manager of exploration for The Carter Oil Company. A veteran of 25 years service with Carter and other Standard Oil Company (New Jersey) affiliates, Brown was chief geophysicist for Carter until his new appointment September 1. He succeeds **N. Y. Ruth** who was elected to the board of directors as contact for Carter's Exploration department.

•

P. M. Johns, Jr., Tulsa, has been named president of Noble Drilling Corporation, succeeding **C. C. Forbes,** who becomes chairman of the board.

•

A. G. McNeese, Jr., administrative assistant to the president of the Houston Oil Co. and its subsidiaries, has been elected to the newly created office of assistant president of the Second National Bank of Houston.

•

Walter D. Baird has resigned as vice president of Southern Geophysical Company and has formed Baird Geophysical Company in Fort Worth. The new company offers service covering seismic, consulting, reanalysis, direction, supervision and contracting activities for the oil industry.

Wilson K. Minor, assistant comptroller of the Standard Oil Company of California, San Francisco, was named a regional vice president of the Controllers Institute of America at the recent annual meeting.

•

George Hunter Coates, independent producer and rancher from San Antonio, Texas, has been named director of the Frost National Bank of San Antonio.

•

Herbert E. Treichler, vice president of Texas Gulf Sulphur Company, has retired after more than 35 years of association with the company. Treichler came to Texas Gulf Sulphur Company from the mines of International Nickel Company in Ontario, Canada, where he had been employed as engineer in the Mining department. Prior to this, he had mining experience in the copper mines of Chile Exploration Company, Chuquicamata, Chili; Phelps Dodge Company in Arizona and the former Chino Copper Company in New Mexico. After graduation from the School of Mines of the University of North Dakota, Treichler spent some time in the lignite industry of that state. Treichler was acting general manager and general manager in charge of production from 1928 until early 1953 when these duties were taken over by his associate, **Harry A. Swem.**

Herbert E. Treichler

•

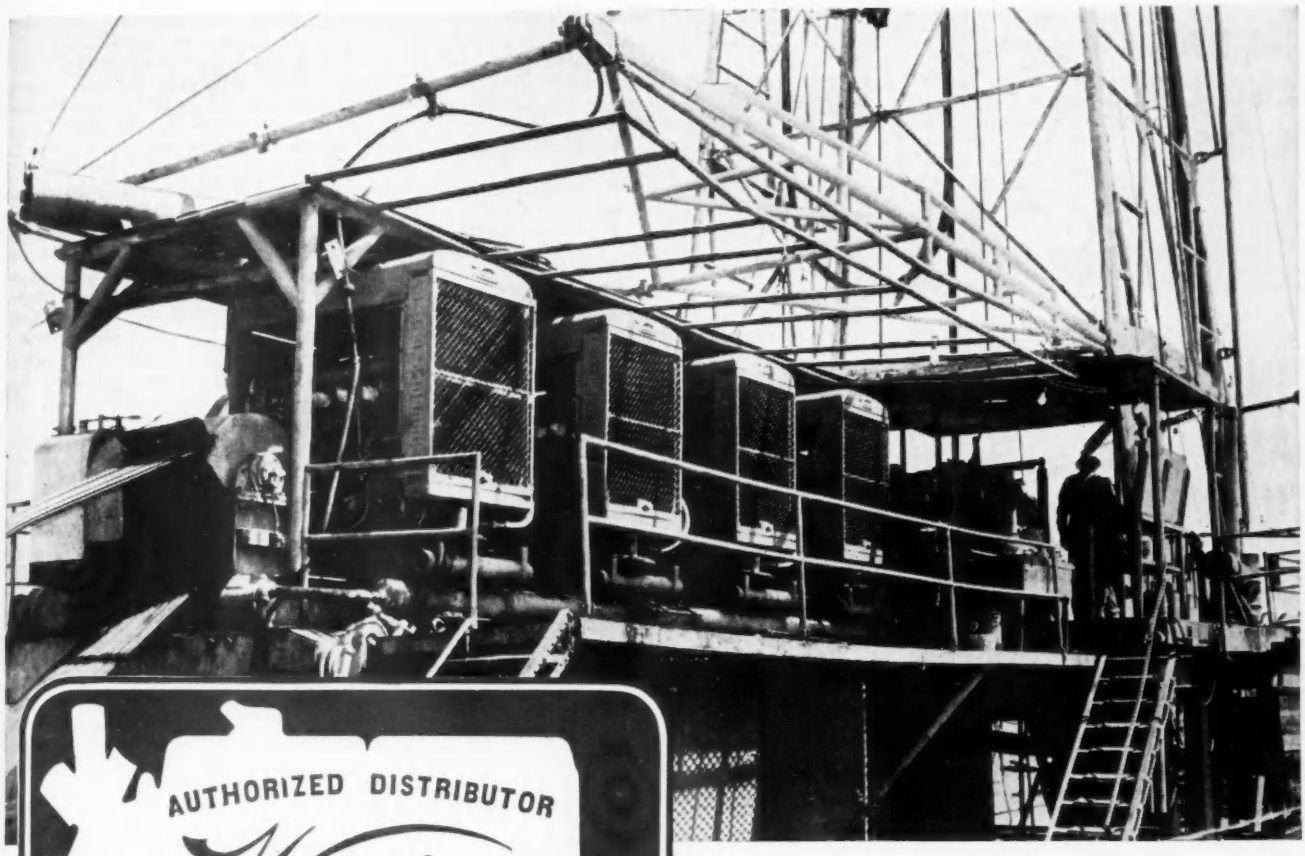
W. C. Lenz has been promoted to district superintendent, Wichita Falls District, of The Texas Company. Lenz succeeds **E. E. Merkt,** who was retired August 31, after completing almost 34 years of service with the company. Lenz has been assistant district superintendent in Wichita Falls since June, 1947. Starting his services with Texaco in 1938 as a roustabout at Jal, N. M., Lenz was promoted to junior engineer in 1939. He transferred to Wichita Falls in 1943 as acting district engineer and was promoted to district engineer in 1946. Lenz was named assistant district superintendent the following year.

•

W. J. Quiles and **E. L. Rawlins** have been elected vice presidents of Union Producing Company. In similar appointments to expand the executive ranks, **C. A. McDowell** was made general superintendent of production and **T. W. Johnson** was named general superintendent of production engineering.

•

Dr. Frank G. Miller has been appointed to head the Petroleum Engineering department at Stanford University to succeed Dr. Richard V. Hughes, who recently resigned to accept a position in industry. Miller comes to Stanford from the U. S. Bureau of Mines where he has been engaged as assistant supervising engineer, Petroleum and Natural Gas Branch, Region III, San Francisco.



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Jerald L. Stauss, Tulsa, of Falcon Seaboard Drilling Company, has been named vice president—operations in the Rocky Mountain area. Stauss will have charge of the Rocky Mountain operations in addition to his present duties as vice president of the Mid-Continent area and treasurer of the company. Stauss, who has been with Falcon Seaboard since it was organized in 1935, has worked in all capacities in the organization.

Jerald L. Stauss

•

William N. Zakis, Durango, Colo., geologist for Continental Oil Company, has been promoted to district geologist with headquarters at Casper, Wyo. He succeeds **Gerald F. Bowers,** who has resigned. Zakis received his bachelor's degree in geology in 1949 from the University of Wyoming and his master's degree in geology in 1950. He joined Conoco at Durango in 1950.

•

Edward Barrett, Oklahoma City, geologist for Continental Oil Company, has been promoted to the newly-created position of regional research geologist, central region. He will continue to make his headquarters at Oklahoma City. Barrett received his bachelor's degree in 1948 from the University of Nebraska. He joined Conoco as a geologist at Oklahoma City after graduation and has served with the company at Oklahoma City since that time, except for a period at Ardmore, Okla.

•

C. Kimball Hamm has been named geologist in the Los Angeles office of Wm. Ross Cabeen & Associates, geologists and petroleum engineers of Los Angeles, Denver, Midland and Oklahoma City. Hamm replaces **Dr. Burdette A. Ogle,** recently transferred to Denver as Rocky Mountain district geologist. Hamm was graduated from Yale University in 1948 and received his M.A. degree from the University of California, after which he joined Union Oil Company. Hamm has had five years experience in geology in Utah, California and the Dakotas.

•

Richard J. Dent and **James T. Rasbury** announce the formation of a new law firm with offices in the Oil Capital Building, Tulsa. They will engage in the general practice of law, specializing in labor law, oil and gas law, and antitrust law. Until recently, Rasbury and Dent were associated with Deep Rock Oil Corportion where Dent served in the Legal Division and Rasbury was manager of the company's employe relations division.

•

C. R. Dodson has resigned as professor and head of the Petroleum Engineering department at the University of Southern California to spend full time in consulting work in the office of Stanley, Stolz and Dodson, Los Angeles firm of consulting petroleum engineers and geologists. Dodson has been a partner in the firm since July, 1951. Dodson was with The Standard Oil Company of California from 1936 to 1947, when he took charge of the Petroleum Engineering department at University of Southern California.

Paul Weaver, recently retired as technical assistant to the vice president of Gulf Oil Corporation, has joined the staff of Texas A & M College, College Station, Texas, as a distinguished research geologist. Weaver will devote part time to teaching seniors and graduate students at the college in ground water geology, and will serve as a consultant for the college system's water research and information center. A native of Kentucky, Weaver has worked throughout the world as a geologist and geophysicist in such places as Trinidad, Venezuela, Mexico, England and Siberia. He became geophysicist for the Gulf Oil Corporation, Houston, in 1926 and became technical assistant to the vice president in 1951, serving until his retirement. Weaver will continue to reside in Houston but will have an office in the Petroleum Engineering building on the campus where he will spend half his time.

•

Ford L. Johnson, manager of Sun Oil Company's Physical Laboratory at Newton Square, Penn., has been appointed acting director of the research and development activities for the Production department of the company. Johnson will direct and coordinate the activities carried on in the various laboratories and field offices of the Production department. **Preston E. Chaney,** manager of the production laboratory at Beaumont, Texas, will serve as assistant director—exploitation. He will maintain his headquarters at Beaumont. **C. N. White** has been appointed administrative assistant to Johnson and will be located at Newton Square.

•

Transfers and Promotions . . .

Personnel transfers in the Exploration-Production department of Ashland Oil & Refining Company include **Dwight Daniels** and **Jack Mason,** petroleum engineers in the Ashland Division, and **W. H. Harrington** of the Midland Division, moved to Henderson, Ky. to work with the Illinois Basin recovery section; **Paul Sturm,** formerly in Henderson, Ky., promoted to division engineer in charge of secondary recovery operations in Ashland; **Morris Seckman** of Henderson, transferred to Ashland; **William Schreiber,** petroleum engineer, transferred from Ashland to Midland, Texas; **Ray Burge,** draftsman in Billings, taking over scouting duties in that division. **Norman G. Miller** joining the Oklahoma City division office as Kansas district geologist and **James Brewer,** joining the control office at Ashland as junior geologist; **James Copen,** transferred from the Geological department in Ashland to the Billings division.

•

Humble Oil & Refining Co. changes in its Production department include **R. A. Watson,** supervising petroleum engineer, Gulf Coast Division office, transferred to the Petroleum Engineering Division, Houston, as supervising petroleum engineer; **H. M. Lemex,** supervising petroleum engineer, Drilling Equipment Division, Houston, transferred to the Gulf Coast Division office as supervising petroleum engineer; **T. V. Miller,** supervising petroleum engineer, Petroleum Engineering Division, Houston, transferred to the Gulf Coast Division office as supervising petroleum engineer; **J. W. Smith,** district petroleum engineer, Livingston District, Gulf Coast Division, transferred to Colorado District, Southwest Texas Division.

DEATHS

Carleton D. Speed, Sr. of Corsicana, Texas, a Texas oil producer for the past 55 years, died October 10. Speed began his long career in the Texas oil industry in 1898. He first purchased three pumping plants to pump wells belonging to other operators and later acquired acreage and drilled his own oil wells. He became interested in the oil and gas business with the late J. S. Cullinan. Speed also operated a drilling business in Beaumont and South Louisana.

•

R. E. Shackelford, 47, of Tulsa, general manager of the Perrault Equipment Company, died in Tulsa August 25. Shackelford was affiliated with the pipe line business during his adult life and served in a managerial capacity with Perrault for eight years.

•

J. S. Shearer, 60, of West Englewood, N. J., died August 25. Shearer formerly was with the Auditing department of the Prairie Oil and Gas Company and was made an auditor of the Producers and Refiners Corporation, an affiliate of Prairie Oil and Gas Company.

•

Charles L. Harding, 47, director and vice president—Middle East affairs of Socony-Vacuum Oil Company, Inc., died September 23 in New York. Harding had been a member of the board of directors since 1948.

•

Tracey B. Wolfe, 74, retired Oklahoma drilling contractor, died September 16 at his home in Sapulpa, Okla.

•

Louis A. School, Jr., 65, geophysicist for The Texas Company and former chief geologist, died September 22 in Houston. School started in the oil industry with a Texas Company subsidiary in 1916 as a field geologist. In 1920 School went to Venezuela and remained until 1925. He became a consulting geologist and was promoted to chief of the geophysical division of the company in Houston in 1929.

•

Daniel Mahoney, 63, of Ardmore, Okla., died September 19. Mahoney was in charge of crude oil purchasing for Stanolind Oil Purchasing Company in southern Oklahoma and northern Texas and had been with Stanolind and its predecessors for 35 years.

•

D. W. Henke, 65, president of Merla Tool Corporation, died August 4 while vacationing in Portage, Wis. Henke had been associated with the oil industry for 35 years as an independent operator and manufacturer of oilfield equipment.

•

Edwin B. Reeser, 81, of Tulsa, died September 12. Former president of the old Barnsdall Oil Co., Reeser had been in the oil business for more than 62 years. He was named "Grand Old Man of Refining" at the 1953 International Petroleum Exposition in Tulsa. He retired as president of the Barnsdall company in 1948. When Sunray Oil Corporation acquired the firm in 1950, Reeser maintained an office with Sunray and served in an advisory capacity.

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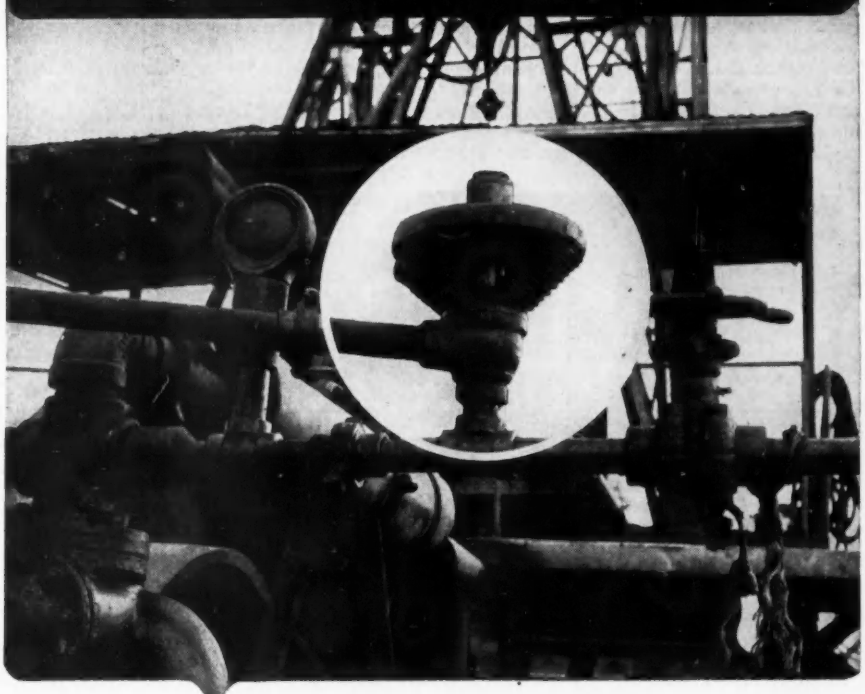

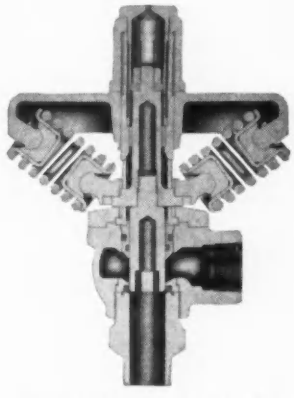

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What's Happening

AMONG INDUSTRY ASSOCIATIONS

New API Chapter Formed in Texas

The Victoria Chapter of API was officially established September 24, 1953, at an organizational meeting held in Victoria, Texas, and attended by 95 oil men. Formation of this new API chapter grew out of the desire for such an organization by many individuals in this active oil and gas area. There are 124 paid up members on the rolls to date.

Officers elected for one-year terms are chairman, Jack Russell, Magnolia Petroleum Co., Vanderbilt; first vice chairman, Royal W. Reiss, Alcoa, Mining Division, Port Lavaca; and secretary-treasurer, Wes Taylor, Schlumberger Well Surveying Corp., Victoria. Directors are W. C. Parks, Gulf Oil Corp., Bloomington; Frank Jared The Sun Oil Company, Victoria; J. J. Harper, Lane-Wells Company, Victoria; Howard Fish, Sunray Oil Corporation, Yorktown; Pat Broussard, Halliburton Oil Well Cementing Co., Victoria; Jim Parry, Sunray Oil Corp., Placedo; C. W. Sharrai, Tidewater Associated Oil Company, Victoria; Dee Russell, Houston Oilfield Material Co., Victoria; O. C. Guess, Monterey Exploration Co., Victoria, and Bill Massey, Alcoa, Port Lavaca.

Organizational proceedings were led by C. L. Bramlett, Halliburton Oil Well Cementing Co., at Corpus Christi, who is vice chairman of the Southwest District, of API, Mike Dillingham, Alice, and Paul Loney, Alice. All three are members of the Gulf Rio Grande Chapter of API at Alice.

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PRESENTING the distinguished service awards at the Texas Mid-Continent Oil & Gas Association meeting were, top, John R. Suman, vice president of Standard Oil Company (New Jersey) to Amon G. Carter. Below, E. A. Landreth, Fort Worth independent oil producer, presents the award to Hines H. Baker.

Texas Oil and Gas Group Elects Harry Bass President

Harry W. Bass, Dallas, Texas, drilling contractor and independent oil and gas producer, was elected president of the Texas Mid-Continent Oil and Gas Association at the annual meeting held in Houston October 5-7.

The Association's 1953 distinguished service awards were presented to Amon G. Carter, Fort Worth, independent oil producer and publisher, and Hines H. Baker, Houston, president, Humble Oil & Refining Company.

Among the speakers were H. S. M. Burns, New York, president of Shell Oil Company; Paul Harvey, Chicago, American Broadcasting Company news commentator; J. Sayles Leach, New York, chairman of the board, The Texas Company; and Maurice T. Moore, New York, chairman of the board of Time, Inc.

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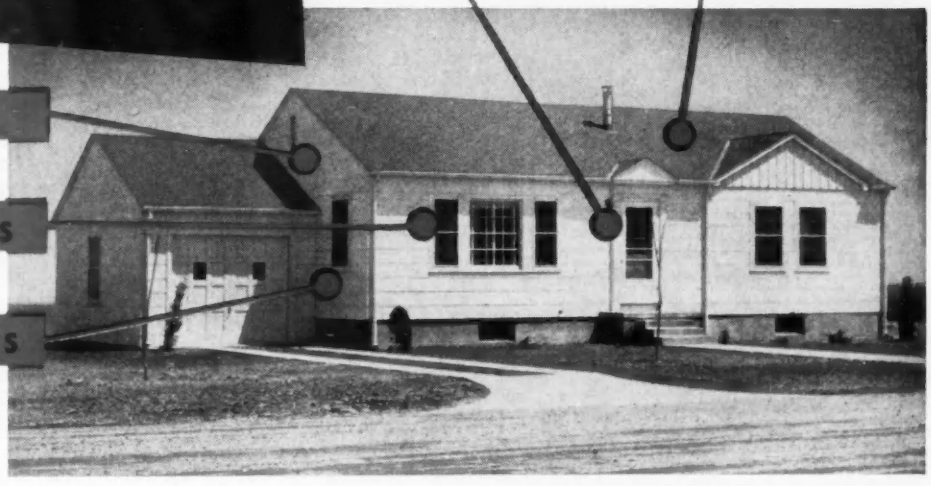

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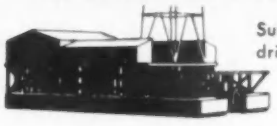
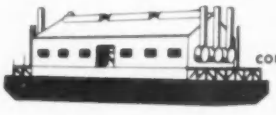


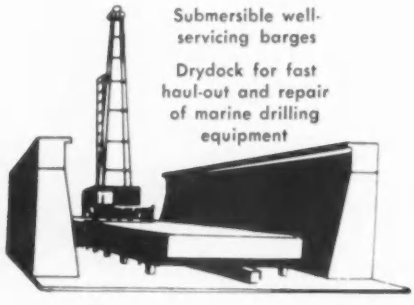
Submersible drilling barges

Tugs



Boiler and compressor barges

Water, oil, and supply barges



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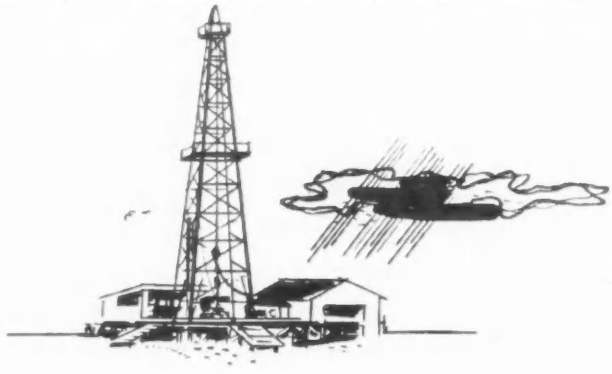
Petroleum Electric Power Association Elects

Officers and directors for 1954 elected at the annual convention of the Petroleum Electric Power Association in Kansas City October 5-7 are, left to right, seated, Thomas E. Graham, Oklahoma Gas & Electric Company; Ned W. Beaudreau, Central Power and Light Company; Fred B. Clark, Arkansas Power & Light Company, secretary-treasurer; James E. Moody, Southwestern Gas and Electric Company, president; and W. L. Pearson, Southwestern Public Service Company, vice president. Standing, Kirby Dawkins, West Texas Utilities Company; Fred Woerner, Texas Electric Service Company; Willis Frohock, Kansas City Power & Light Company; Harvey Cherry, Houston Lighting and Power Company; V. H. Ohrman, Texas Power and Light Company; and Tom D. Hoskins, Louisiana Power & Light. Not shown is Henry C. LeVois, Gulf States Utilities Company.

Oil, Gas Sessions Planned For AIEE Meeting Nov. 2-6

Three sessions of the fall general meeting of the American Institute of Electrical Engineers, to be held in the Hotel Muehlebach, New York, November 2-6, will be devoted to electrical applications in petroleum refining and pipe line transmission of natural gas and oil. Eight technical papers by electrical engineers who are specialists in this field are scheduled to be presented.

The papers are "Natural Gas Plant Power Distribution Systems," by C. D. Catt, El Paso Natural Gas Co., and J. K.



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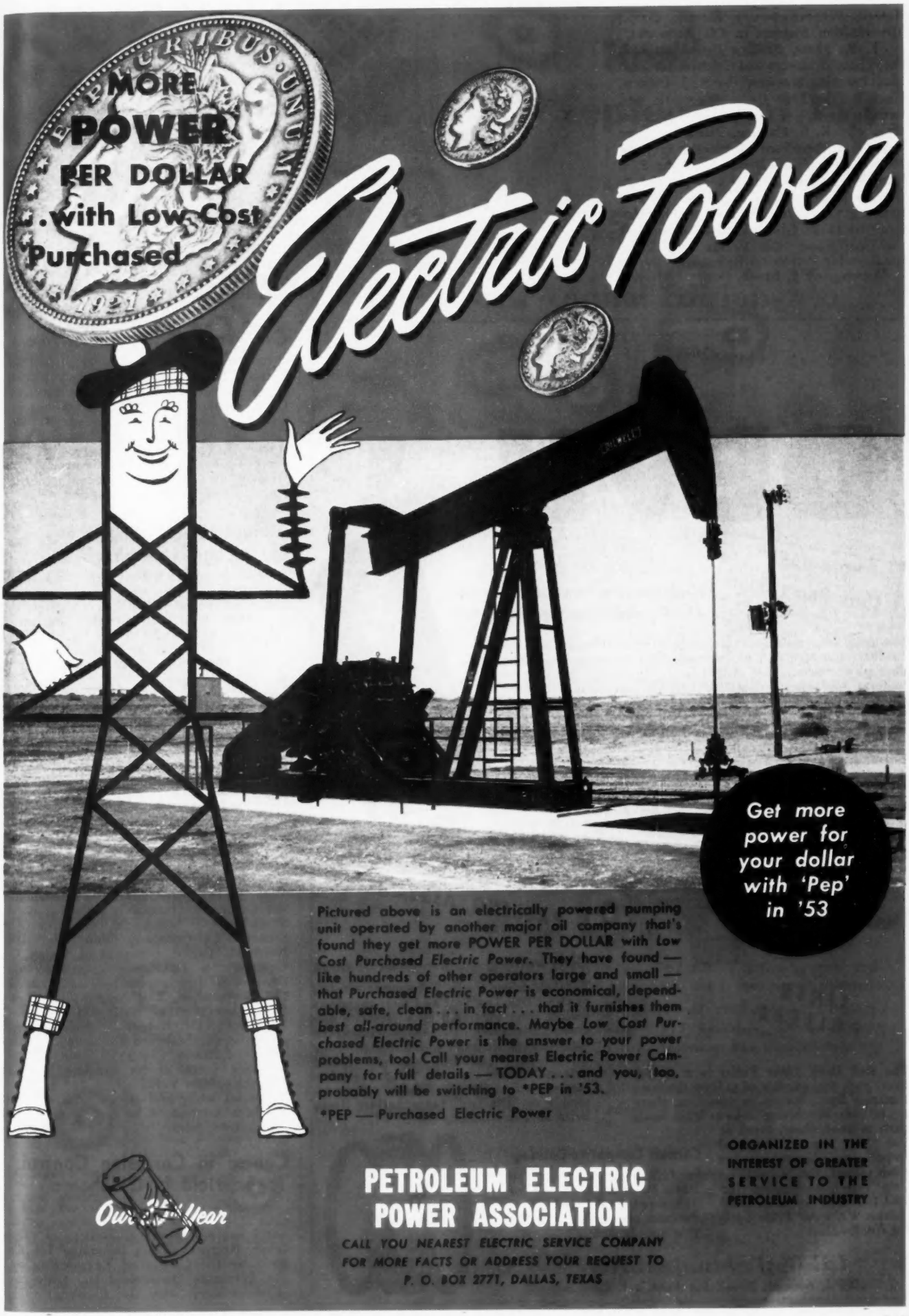
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Howell, Westinghouse Electric Corp.; "Distribution Systems in Oil Refineries," by T. R. Shaw, Phillips Petroleum Co.; "Selection of Motors and Controls for Pipe Line Pumping Stations," by R. J. Osborn, Sinclair Pipe Line Co.; "Automatic and Remote Control of Electric Pipe Line Stations," by R. S. Cannon, Plantation Pipe Line Co.; "Petroleum Microwave Progress 1950-53," by E. B. Dunn, Keystone Pipe Line Co.; "Application of Outdoor Metal-clad Switchgear," by E. R. Hoyle, Sinclair Refining Co.; "Protection of Large Motors," by C. R. Olson, Westinghouse Electric Corp.; and "Oil Versus Air Circuit Breakers for Petroleum Refineries," by W. B. Wilson, and J. Erwin, General Electric Co.

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High Hardness and High Carbon The Combination for Longer Life

Maximum wear resistance results from the combination of *high hardness* and *high carbon*, not from high hardness alone. The deep wear resistant case of Red Devil "Dia-Hard" liners has a uniform *hardness* of 62-64 Rockwell "C" and a uniform *high carbon* content in excess of 1.00%. This combination of a case of high hardness and abrasive resistant carbides with a core of high tensile strength and ductility is obtainable only by our special "Dia-Hard" process.

Integrally forged liner glands; precision honed bore. Outside dimensions are accurately machined assuring perfect working fits with liner packing assembly and pump cylinder for positive sealing against modern high pressure pump operation.

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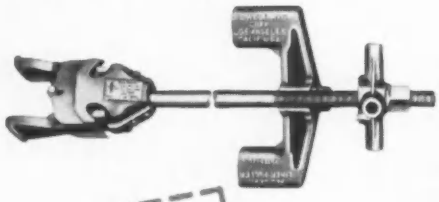

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Give warning before pump damage

Tell-Tale Liner Packing Assembly consists of two "Dia-Tex" oil and heat resistant sealing rings separated by a precision machined corrosion-resistant steel lantern ring. Internal leakage is detected instantly through the tell-tale hole before costly fluid cuts can damage the slush pump. For information on Red Devil Tell-Tale Packing Assembly or "Dia-Tex" Liner Sealing Rings *write for Price Catalog No. P-121.*

LINER PULLERS

The Red Devil Liner Puller is a strong, heavy duty tool capable of pulling the most obstinate liner. Simple in operation, there are no pins, connecting links or other small parts to bend, shear, break or lose. Two Types: "Universal Type" (as illustrated) for slush pumps, the "Expanding Grip Type" for pulling thin wall tube-type liners in small pumps. *Write for Price Catalog No. P-122.*

Consult Composite Catalog

for full information on Red Devil Products or write for price catalogs. Red Devil Products are available through your supply store.

Oil Well Manufacturing Corp.

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Oil Men's Club Names Officers

Officers of the recently organized Oil Men's Club of Sedalia, Mo., elected at the club's first meeting were, left to right, Cecil Owen, Continental Oil Company, secretary; Lloyd Parker, Sinclair Refining Company, second vice president; Kenneth Buchholz, The Texas Company, president; Jerry Brown, Brown Oil Company, first vice president; and M. E. Austin, Socony Vacuum Oil Company, treasurer.

Annual API Meeting Opens In Chicago November 9

Leading representatives of government, banking and insurance, business, and all phases of the oil industry will address the thousands of oil men attending the thirty-third annual meeting of the American Petroleum Institute at the Conrad Hilton and Palmer House in Chicago November 9 through 12.

General session speakers will include Douglas McKay, U. S. Secretary of the Interior, and Petroleum Administrator for Defense, Washington, D. C.; Johnston Murray, governor of Oklahoma; Lewis W. Douglas, board chairman for The Mutual Life Insurance Company, New York; John J. McCloy, board chairman for The Chase National Bank, New York; P. C. Spencer, president of Sinclair Oil Corp., New York; and Frank M. Porter, president of the API.

Oil company executives who will speak include John R. Suman, vice president of Standard Oil Company (New Jersey), New York; A. W. Peake, president of Standard Oil Company (Indiana), Chicago; A. A. Stambaugh, board chairman for The Standard Oil Company (Ohio), Cleveland; Reese H. Taylor, president of Union Oil Company of California, Los Angeles; Charles S. Jones, president of Richfield Oil Corporation, Los Angeles; H. S. M. Burns, president of Shell Oil Company, New York; Dr. Robert E. Wilson, board chairman for Standard Oil Company (Indiana), Chicago; and J. E. Dyer, marketing vice president for Sinclair Refining Company, New York.

Special train and plane transportation has been announced by the railroads and airline companies.

Course in Corrosion Control To Be Held in Oklahoma

A corrosion control short course will be held at the extension study center on the north campus of the University of Oklahoma, Norman, Okla., December 1-4. Offered by the College of Engineering and the Extension Division of the University in cooperation with the Central Okla-

homa Section of the National Association of Corrosion Engineers, the course will be directed by John P. Roberts, professor of metallurgy.

Registration cost is covered by a fee of $15. Registration and other information may be obtained from John B. Freeman, Director, Department of Short Courses and Conferences, University of Oklahoma, Norman.

Karl L. Kellogg Elected President of AAODC

Karl L. Kellogg, of K. L. Kellogg & Sons, Compton, Calif., was elected president of the American Association of Oilwell Drilling Contractors at the group's thirteenth annual meeting in Denver October 4-6.

Karl L. Kellogg

Other officers elected were E. Dale Mount, Harry Bass Drilling Company, Dallas, vice president-at-large; J. S. Bell, Henry Black & Sons, Midland, Texas, vice president — West Texas and New Mexico; Field M. Davis, Field Drilling Company, San Antonio, Texas, vice president —Gulf Coast; N. H. Wheless, Jr., Wheless Drilling Company, Shreveport, La., vice president—Cretaceous and Tertiary Basins; Gail C. Culter, Culter Drilling Company, Tulsa, Okla., vice president—cable tools; Dee A. Sikes, Helmerich & Payne, Inc., vice president—Central Mid-Continent; J. K. Kellogg, K. L. Kellogg & Sons, vice president—California; J. V. Boxell, Calvert Drilling, Inc., Olney, Ill., vice president—Illinois, Michigan, Indiana and Kentucky; Bert Sager, Dunbar Drilling Company, Denver, vice president—Rocky Mountains; J. P. (Bum) Gibbins, J. P. (Bum) Gibbins, Inc., Midland, Texas, vice president—well servicing; L. A. Beecherl, McDaniel & Beecherl Drilling Company, Dallas, treasurer; W. L. McClusky, M. J. Delaney Company, Dallas, secretary; Brad Mills, executive vice president; and Marion S. Church, general counsel.

G. Stewart Brown Elected National Chairman of OIIC

G. Stewart Brown, public relations manager of Standard Oil Company of California, has been elected national chairman of the Oil Industry Information Committee for 1954.

G. Stewart Brown

Brown will succeed Stanton K. Smith, president of Smith Oil & Refining Company, Rockford, Ill., on January 1.

Vice chairmen elected were Richard Rollins, secretary, The Atlantic Refining Company, Philadelphia; W. R. Huber, general manager of retail sales, Gulf Oil Corporation, Pittsburgh; Douglas Campbell, public relations director, The Pure Oil Company, Chicago; and A. D. Eubank, division manager, Quaker State Oil & Refining Company, Kansas City. John S. Cooke, of the API, New York, was re-elected secretary.

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MANAGERS, ENGINEERS, AGENTS, etc. 567 names and addresses and the names of the companies in the book with which they are connected.

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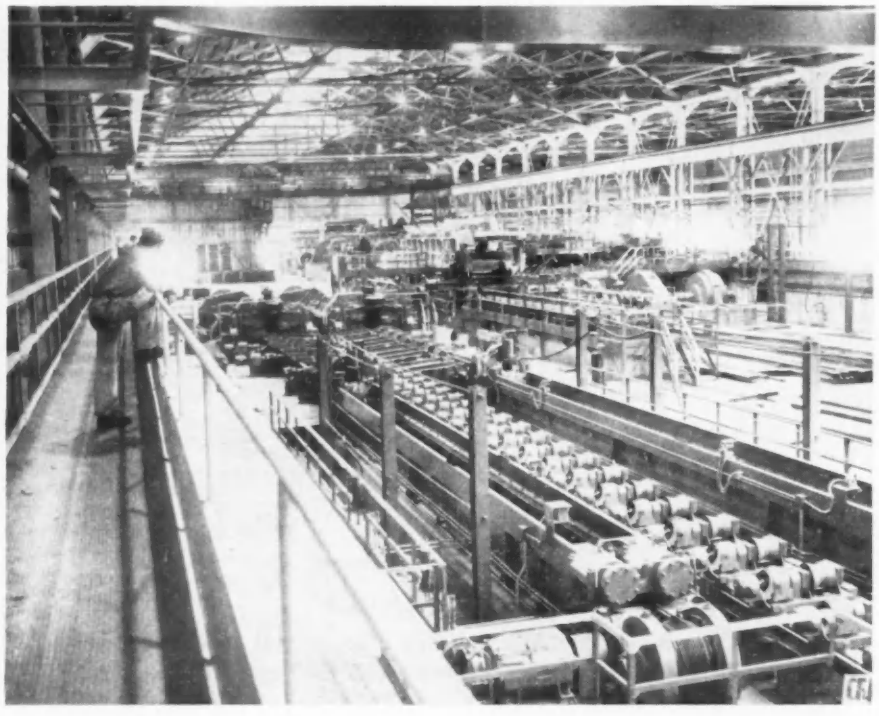
What's Happening

AMONG SERVICE AND SUPPLY MEN



INSIDE VIEW of new seamless tube mill at Pueblo, Colo., where seamless steel tubing and casing are being manufactured for the oil and gas industries of the nation.

Colorado Fuel and Iron Opens New Tube Mill

The Colorado Fuel and Iron Corporation recently opened its new $30 million seamless tube mill at Pueblo, Colo. The new mill, the first west of the Mississippi, will supply seamless steel tubing and casing to the oil and gas industries of the western United States and Canada.

The new structure covers more than 10 acres under one roof, including billet yard and pipe storage. A. F. Franz, president, stated that when full production is reached, the mill will turn out more than 150,000 net tons of seamless pipe a year.

A giant 70-foot rotary furnace, one of the largest ever constructed for American industry, has been installed in the new mill. The furnace is a four-zone unit, with separate temperature controls on each zone. Gas-burning equipment and hearth-driving machinery are located in the center section of the furnace.

Billets to be processed in this new rotary furnace will range in size from three inches to 8½ inches in diameter and from four feet nine inches to 16 feet in length. All billets for the tube mill will be round.

Construction of the new mill and related facilities started in February, 1952, with 625,000 cubic yards of earth being moved to prepare the site. The steel framework alone took five months to build. The completed mill, consisting of five one-story buildings joined side by side, contains 37,000 cubic yards of concrete and 10,000 tons of structural steel.

Dedication ceremonies were held in Pueblo the first week in October.

Hercules Tool Announces New Field Representatives

Several additions to the field staff of Hercules Tool Company of Tulsa have been announced. Thomas R. McIntyre of Calgary, Alberta will represent the firm in the provinces of Alberta and Saskatchewan, Canada.

W. W. Coonrod, Great Bend, has been appointed field representative in Kansas and A. D. Eastham, Borger, will serve Hercules in the Texas Panhandle area.

Sargent Engineering Corporation Establishes Field Stores

Sargent Engineering Corporation, manufacturers of oil well pumps for more than 30 years, has established its own sales and service field stores in 15 mid-continent producing areas.

Sargent field stores are located in Odessa, Snyder, Houston, Sundown, Wichita Falls and Winnsboro, Texas; Oklahoma City, Pawhuska and Seminole, Okla.; Hobbs, N. M.; Chase and Russell, Kansas; Grayville, Ill.; Magnolia, Ark.; and Rangely, Colo. The same service facilities will be available as have been maintained in the Sargent field stores in Long Beach, Bakersfield, Santa Maria, Ventura, Taft and Huntington Park, Calif.

Booth Named Distributor For National Supply Company

Daniel M. Booth, a resident of Mexico City since 1930, has been appointed distributor for the Engine Division of The National Supply Co. through a newly-formed company, Consultores y Abastecedores Industrials. Booth will handle the sale of National Supply's superior and atlas diesel engines throughout Mexico, except in Nyarit and Baja, California and the state of Sonora. The company will also handle other machinery and equipment. Booth previously served as branch manager of the Worthington Corp. in Mexico City and later was manager of the Mexican subsidiary of the Nordberg Manufacturing Co.

Daniel M. Booth

Magcobar Announces Personnel Appointments

Magnet Cove Barium Corp. has announced the appointment of a special sales representative for the Houston area and two new engineering consultants.

John H. Moran, who has been a salesman in the Texas Gulf Coast Division since 1949, has been named special sales representative. He was born in Wyoming, Ill.

Robert B. Hyde, Jr., will serve as a technical and industrial engineering consultant. He has been with Magcobar since graduating from Texas A. & M. in 1949 and was formerly district manager in Oklahoma City.

Wallace W. Frazer has been appointed an engineering consultant in Magcobar's Denver office. He received his degree from Stanford University.

Youngstown Sheet and Tube Appoints Prochak to Post

Walter J. Prochak has been appointed assistant superintendent of the Cold Drawn Bar Department at Brier Hill works of The Youngstown Sheet and Tube Company.

Prochak, a native of Youngstown, attended public schools in nearby Struthers, went to Ohio State University and to Youngstown College. He supplemented this with night school and correspondence courses in metallurgy, maintenance engineering and economics.

Prochak began working for the company as a crane follower during summer vacations. On March 17, 1937, he joined the company as a tester in the metallurgical department. Three years later he became a metallographer; was appointed metallurgist at the companys' Rod and Wire plant at Struthers in 1947 and the following year was named metallurgist at the Brier Hill Works.

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Vernon Oil Tool Is Licensee For Greenwood Valves

The Vernon Tool Company, Ltd., Alhambra, Calif., and D. H. Greenwood, valve engineer, have recently completed a contract whereby Vernon Tool Company, Ltd., becomes the exclusive licensee for tthe manufacture and sale of Greenwood valves.

The Greenwood line, including the triple action quick closing safety valve, the vertical swing horizontal check valve, the unitized by-pass check valve, and the newly introduced gate valve line blind, will be operated a The Greenwood Valve Division of Vernon Tool Company, Ltd.

John Walker, valve sales engineer, is being transferred to the Houston offices of Vernon Tool Company, Ltd., to assist in introducing the line of Greenwood valves in the Mid-Continent and Gulf Coast areas.

Peter A. Puleo To Represent Black, Sivalls & Bryson

Peter A. Puleo has been named to represent Black, Sivalls & Bryson Inc., in the St. Louis district in its line of safety heads and vent valve equipment.

Puleo attended the St. Louis University School of Business and received his B.S. degree from the School of Chemical Engineering, Washington University. Early this year he established his own business, the Industrial Process Equipment Company in St. Louis.

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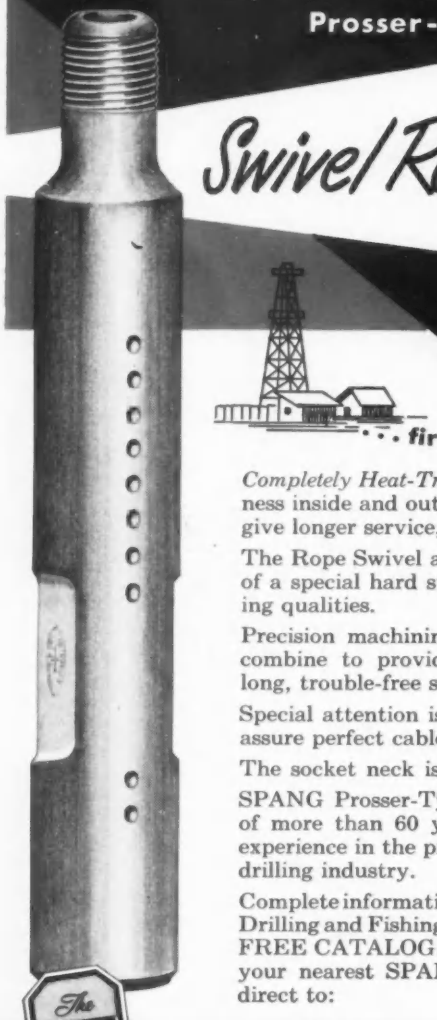

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W. L. Neely

John T. Farrell

Farrell and Neely Named To Rockwell Positions

W. L. Neely, tax supervisor of Rockwell Manufacturing Company, and John T. Farrell, supervisor of the firm's headquarters Accounting department, have been appointed assistant controllers.

Farrell has been with the company seven years and Neely joined the firm five years ago. Farrell received a M.A. degree at the University of Pittsburgh in 1946 before joining Rockwell. Neely was appointed tax supervisor a year ago after serving four years as division accountant for the company's Nordstrom Valve Division in Oakland, Calif.

Alten Promotes Bayne; Names Product Development Engineer

Fred R. Bayne has been promoted to the position of chief engineer with Alten Foundry & Machine Works, Inc. A graduate of Virginia Polytechnic Institute, Bayne came to Alten as assistant chief engineer from the Cincinnati Milling Machine Company in 1951.

In another appointment, William A. Morris, Jr. was named product development enginer. Morris was consultant engineer at Parkersburg Rig & Reel for the past 10 years.

J. Curran Freeman Elected Controller of Dresser

J. Curran Freeman has been appointed to the office of controller of Dresser Industries, Inc.

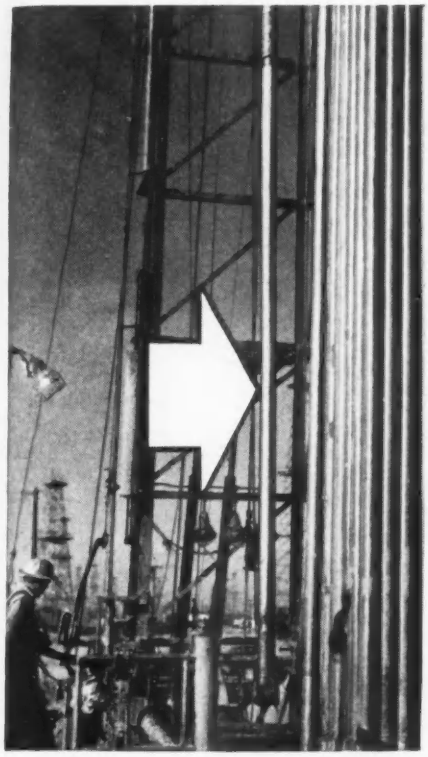
Freeman came to Dresser Industries from the Ford Motor Company and, was associated formerly with Allis-Chalmers. He is a member of a number of professional societies including the Controllers' Institute and the National Association of Cost Accountants. Mr. Freeman is a native of Iowa and is a graduate of St. Louis University.

Martin-Decker Appoints Two Service Engineers

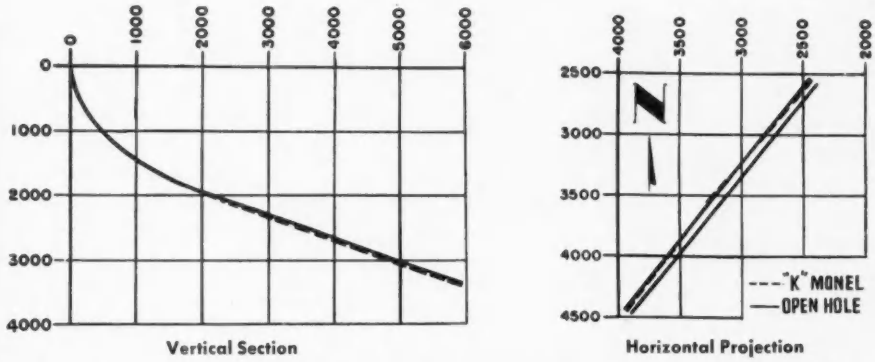
Frank Kelso and John Tatum have been appointed Oklahoma and West Texas service engineers for the Martin-Decker Corporation and will be headquartered in Oklahoma City and Odessa respectively.

Kelso, a UCLA graduate, is being transferred to the Oklahoma area after a year's service with Martin-Decker Corporation at Odessa. In his new duties he will be working with E. M. "Mutt" Donovan, Mid-Continent sales engineer with headquarters at Oklahoma City.

Tatum joins Martin-Decker with oil field and instrument repair experience gained from the Snyder Co., Reed Roller Bit Co., and the Republic Supply Co., all of Odessa. He will be working with Carroll Kelso, sales engineer in West Texas and New Mexico.



Set-up of string in the Wilmington, California field. The Servco 20' "K" Monel Collar is as strong as any steel drill section, takes drilling stresses equally well. No special fittings or handling.



How Open-Hole and "K" Monel Collar Surveys Compare – Surveys by both methods were checked in a rapidly built up high angle hole. Notice how closely they agree.

Hit your Underground Targets Right on the Nose!

You can control vertical and directional drilling accurately, today . . . and at a cost so low that it no longer pays to risk missing underground targets.

You do it like this: Use a drill collar made of permanently non-magnetic "K"®Monel. It receives the survey instrument and holds it in exact position for accurate recording. It isolates the instrument from magnetic effects of the string which might cause error. It keeps its non-magnetic qualities even with extensive cold-working. You will get an accuracy that matches open-hole surveys but costs far less . . . because you don't have to round-trip pipe every time you make a survey.

While going remains easy, you will probably want to make several surveys on a wire line through the drill pipe during each bit run. When hard formation is reached, and bit runs become shorter, you can "go-devil" the instrument at the end of each run and retrieve it when the drill string is pulled.

To get a complete survey, "go-devil" a multi-shot instrument the same way. Then take all the pictures you want on the way up. Regardless of angle, the "K" Monel Collar keeps the instrument aligned and prevents "droop" error.

Isn't that easy . . . and inexpensive? Not an extra round trip! No pulling of center bits! No lost instruments or snagged wire to retrieve. Often, in fact, you can get your records while retrieving a core barrel or performing some other chore.

When it comes to positioning deflecting tools, use a "K" Monel Orientation Sub in the drill string. It will help insure the same accuracy and protection during your survey.

The SERVCO CORPORATION can supply you with over 35 different types of drill collars and orientation subs in popular sizes and fitted with conventional tool joints. SERVCO is located at 904 Security Building, Long Beach 2, Calif.

To handle other tough oil field problems, calling for special metals like "K" Monel, come to Inco. One of the many Inco Nickel Alloys is likely to provide just what you need.

THE INTERNATIONAL NICKEL CO., INC.
67 Wall Street New York 5, N. Y.

Inco Nickel Alloys

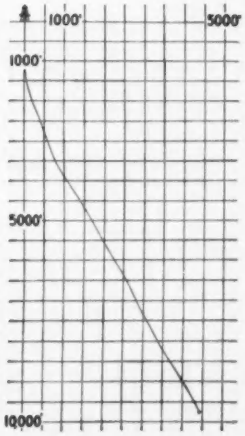
MONEL® • "R"® MONEL • "K" MONEL
"KR"® MONEL • "S"® MONEL
INCONEL® • INCONEL "X"®
INCONEL "W"® • INCOLOY® • NICKEL
NIMONIC® Alloys • DURANICKEL®
LOW CARBON NICKEL

Why Survey Drill Collars are made of "K" Monel

1. "K" Monel is permanently non-magnetic down to −100°C. Its maximum permeability of 1.02 is only slightly greater than air at 1.00. It will not become magnetic through cold-working in the well or as a result of high well temperatures.

2. "K" Monel compares favorably with steel. "K" Monel Collars don't wear quite so well as steel collars but they are tougher and stronger. Yield strength, 120,000 psi; tensile strength, 153,000 psi; elongation, 23%; Brinnell hardness, 278.

3. "K" Monel resists corrosion. In marine locations and in sour wells, "K" Monel gives outstanding performance . . . often outlasts other materials by years.



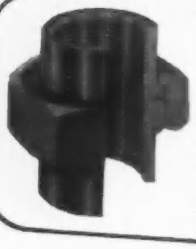
Survey of an Offshore Directionally Drilled Well

Max. angle, 36° 30'; total deflection, 4,433 ft.; total measured depth, 10,900 ft.; true vertical depth, 9,748 ft.; drill collar "K" Monel.

Catawissa PERFECT SEAL Unions

HOT FORGED from solid, rectangular steel bars, designed and produced for dependable, long-life service under the severest piping conditions!

A TYPE FOR EVERY USE!
FOR ALL PRESSURES!
FOR ALL TEMPERATURES!



Standard & Double Extra Heavy
UNIONS
Available with screwed or socket weld ends. 3000-lb. sizes 1/8" to 3"; 6000-lb. sizes 1/8" to 2".

ORIFICE UNIONS
With screwed or socket weld ends. 3000-lb. and 6000-lb. service.

MALE & FEMALE UNIONS
With steel-to-steel, bronze-to-steel, stainless steel-to-steel or orifice seats. 3000-lb. service only.

Standard & Double Extra Heavy
LUG NUT UNIONS
Hammer-type for quick opening and quick closing.

write for your free copy of
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for complete information

CATAWISSA VALVE AND FITTINGS COMPANY
60 Mill St. • CATAWISSA, PA.

Don Turner Joins National Tank As Administrative Assistant

Don Turner, former attorney for Sohio Petroleum Company in St. Louis, is joining National Tank Company, Tulsa, as its general counsel and administrative assistant.

Don Turner

Turner, a graduate of the University of Illinois and of St. Louis University, recently resigned as executive vice president of Rinehart Oil News at Dallas, Texas. Formerly he practiced law in the oil fields of Illinois, Indiana and Kentucky with offices at Mt. Vernon, Ill. In 1941 Turner joined Sohio Petroleum Company at Mt. Vernon to organize the firm's Legal and Title department. After serving in the Navy, Turner rejoined Sohio in the St. Louis office in 1945 as administrative assistant and legal advisor to J. Frank Wilson, Sohio's vice president-pipe line and crude oil purchasing. He joined Rinehart in 1950.

Breedlove to Handle Post In Venezuela for Guiberson

Mitchell W. Breedlove, sales and service representative for The Guiberson Corporation, has been given a special assignment in Venezuela.

Mitchell W. Breedlove

With temporary headquarters in Caracas, Breedlove will offer technical advice and assistance to drillers and producers on the use and applications of Guiberson oil field equipment. Breedlove has extensive knowledge of this equipment, having been with Guiberson since 1936 in various capacities as machinist, engineer and sales and service representative.

Magcobar Announces New District Managers

Appointment of a number of new district managers has been announced by Magnet Cove Barium Corporation.

Roy C. Stringfellow is new manager of the Shreveport district. He was formerly a field service engineer for Magcobar in the Shreveport area. He attended Centenary College and is a native of Shreveport.

New manager of the Regina, Saskatchewan, district is Harold A. Fogarty. Fogarty was a field service engineer in Regina before his present appointment. He attended the University of Oklahoma.

James E. Carlton will manage the Laurel, Miss., district. A graduate of Texas A. & M., he was previously a field service engineer at Goliad, Texas.

Thomas L. Cox has been named to manage the northern Oklahoma district with headquarters at Enid. Formerly a field service engineer in Enid, he is a graduate of Oklahoma City University.

The southern Oklahoma district will be managed by Cleron L. Henderson. His headquarters will be in Ardmore where he was formerly a field engineer. He is a graduate of Oklahoma A. & M.

INCREASE PRODUCTION

CLEAN OUT CHOKING SAND

Excessive sand and sediment holds back your oil. For fast, easy clean out with fewer round trips and less down-time, use world famous Miller Sand Pumps.

PUMP & BAILER SIZES
O.D.—2½, 3, 3½, 4¼, 5, 5½, 7 inches.
Lengths—20, 25, 30 ft.

Composite Catalog Page 3433

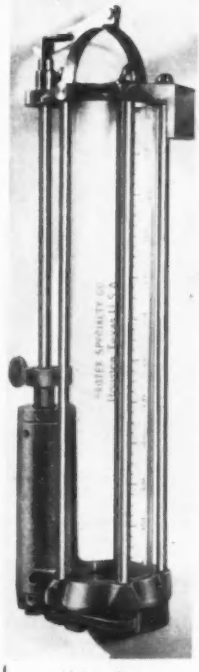
Write for descriptive price list.

MILLER SAND PUMPS

MILLER SAND PUMP CO.
General Offices, Box 4516
Oklahoma City 9, Okla.
EXPORT OFFICES
30 Rockefeller Plaza
NEW YORK CITY 20, N. Y.

Pump

Bailer



Protek OIL THIEF

Clear plastic barrel

Replaceable "O" ring valve seat

One line, adjustable controls

Simple, one-spring design

12", 16", 18", 24", and 36" sizes

Write for literature!

PROTEK SPECIALTY COMPANY
3340 DIXIE DRIVE
HOUSTON, TEXAS
PHONE: LI nden 3988

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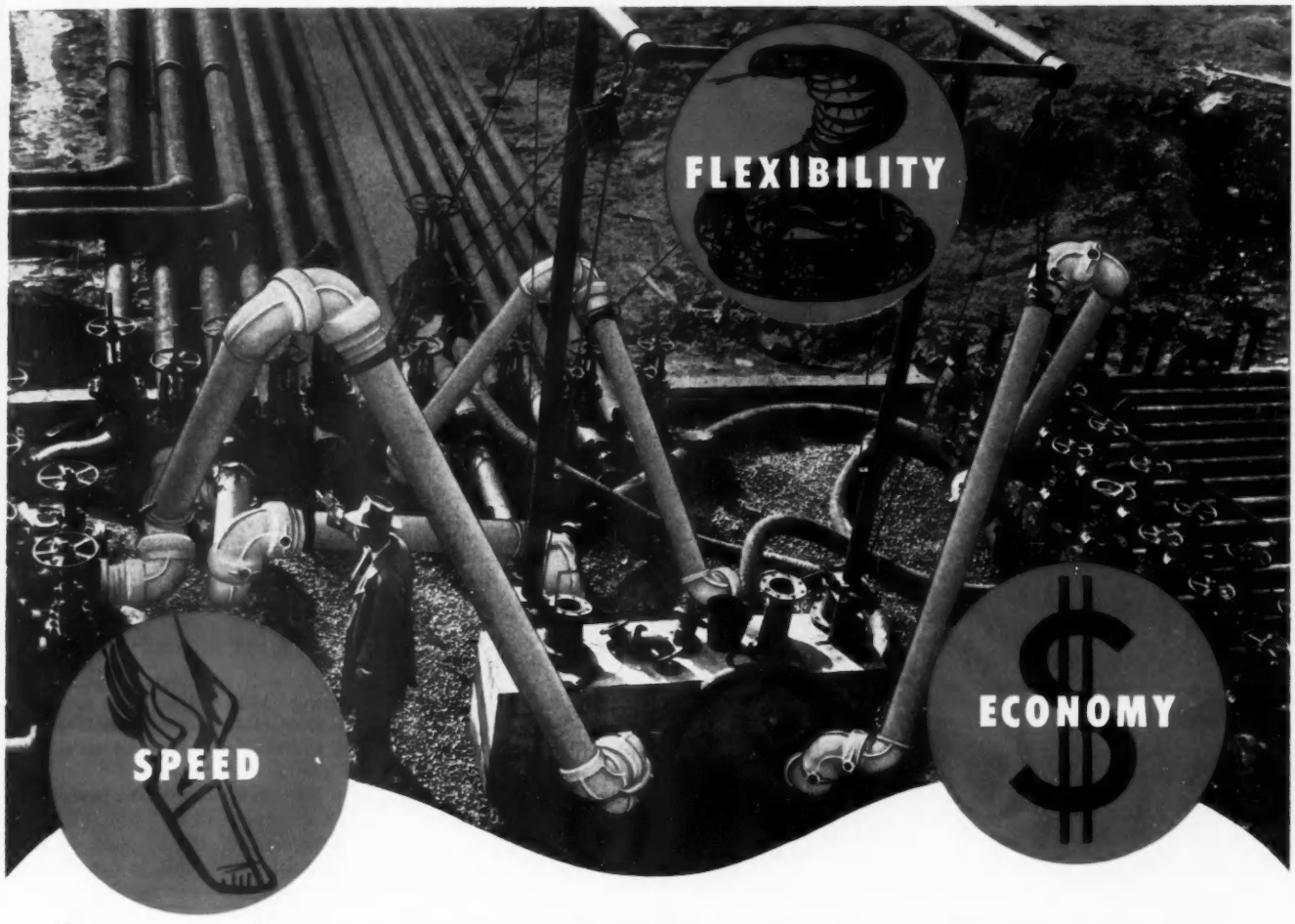


CHIKSAN Swivel Joints illustrated in this installation, facilitate the speedy, economical handling of various fluids through 16 lines from loading dock to manifolding pit — a distance of 800 feet. Since each line leads to a separate tank through the manifold, cross contamination is eliminated.

CHIKSAN Swivel Joints in the pump manifold above enable operator to pull base stock from outside storage into the plant and direct flow to proper vessel or proportioner.

The Flow of Enterprise Relies on

CHIKSAN

Ball-Bearing Swivel Joints

CHIKSAN Manifolding Saves 3 Ways!

- √ ORIGINAL INSTALLATION
- √ NO CONTAMINATION LOSSES
- √ LOW COST OPERATION

Original cost of CHIKSAN flexible line manifolding installations often run as much as 50% less than fixed line manifolding operations which incorporate costly multiple valve and line systems.

A CHIKSAN manifolding operation is simplified in its entirety — providing complete flexibility, mobility and ease of operation in limited spaces.

CHIKSAN manifolding installations reduce line hook-up time — keep pit floor clear of lines thereby providing greater working areas.

CHIKSAN manifolding operations facilitate the transfer of all types of fluids safely and rapidly under extreme climatic conditions with no possibility of cross contamination.

CHIKSAN manifolding installations are specifically engineered for long life — easy and economical maintenance, and render years of trouble-free operation.

Our Engineering Research and Development Department will welcome inquiries on your manifolding problems.

Write for Catalog 53-C, Dept. WO-11

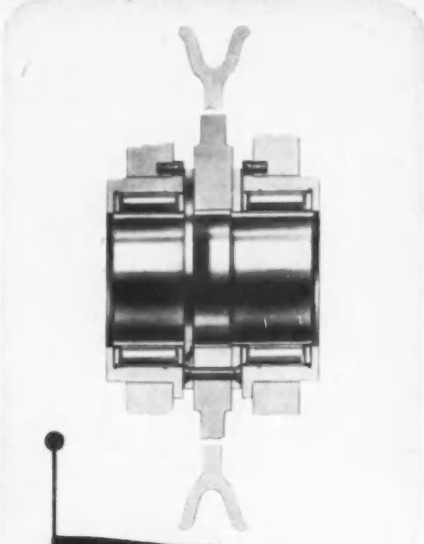
CHIKSAN

Representatives in Principal Cities

CHIKSAN COMPANY • BREA, CALIFORNIA • Chicago 28, Illinois • Newark 2, New Jersey

Well Equipment Mfg. Corp. (Division), Houston 1, Texas • Chiksan Export Company (Subsidiary), Brea, California • Newark 2, N. J.

STANDARD
OF THE
PETROLEUM INDUSTRY
Since 1905



Regan *time proven*

DUAL BEARINGS

... for greater bearing life and longer wire line life. With Regan exclusive, rotating inner race Dual Bearings, each sheave has an integral rotating pin which distributes bearing wear around the entire area of the pin. Bearings on *each side* of the rotating pin prevent oscillation of the sheave. This construction permits use of smaller bearings which enables the block to operate at greater speed with less friction and minimum wire line slippage. Exclusive Regan long-lived Dual Bearings are embodied in all Regan Crown and Traveling Blocks.

Write for detailed information.

50

Regan

Forge & Engineering Co.

SAN PEDRO, CALIF.
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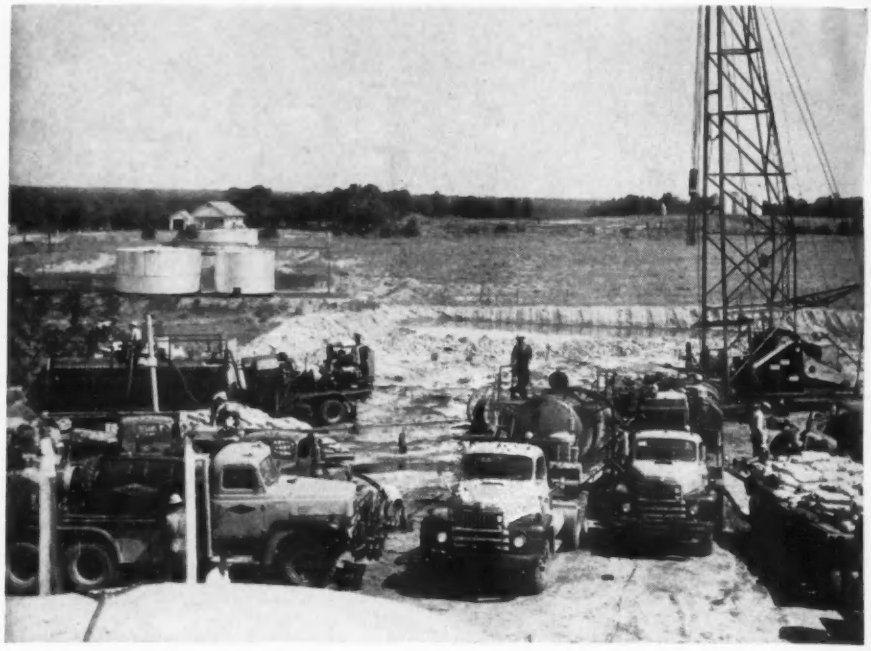
Exclusive Mid-Continent and Export Distributor:
MID-CONTINENT SUPPLY CO.
General Offices: Fort Worth, Texas

Quality – Wrought on the Forge of Experience



SOME OF THE 22 PIECES of equipment used by Dowell engineers in performing a record sand fracturing job at Sun Drilling Company's Miller 8 well in the Tatums field, Carter County, Okla. In background are seen some of the lease tanks from which 100,000 gallons of oil were used in the course of the operation.

Record Fracturing Operation Performed by Dowell

A sand fracturing operation in which a record 100,000 gallons of oil mixed with 100,000 pounds of sand was injected into a well has been successfully performed by Dowell Incorporated of Tulsa, Okla. From the standpoint of the amount of fracturing materials used, this is considered the most massive operation of its kind carried

The PELICAN

THE *Lowest* PRICED TWO-INCH PUMP OF ITS CAPACITY ON THE MARKET

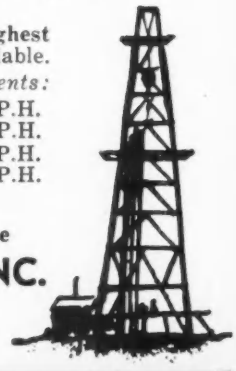
Gorman-Rupp self-priming centrifugal pumps are especially designed to meet the toughest requirements. The Pelican has many useful applications around a lease and -- it challenges any pump its size and type to equal its performance -- it never quits.

Gorman-Rupp pumps are the **Quickest Priming, Highest Priming, Fastest Pumping** and **Most Reliable** pumps available.

There's a choice of four lightweights for any requirements:

The Midget 1½"	Weight 62 lbs.	5500 G.P.H.
The Pelican 2"	Weight 70 lbs.	7500 G.P.H.
The Hawk 2"	Weight 110 lbs.	10,000 G.P.H.
The Eagle 3"	Weight 117 lbs.	18,000 G.P.H.

Ask for Bulletin No. 7-LW-13



Mid-Continent and Gulf Coast Oilfield Representative

HENRY H. PARIS DISTRIBUTOR, INC.

1125 Rothwell Street, Houston, Texas

A COMPLETE LINE OF CENTRIFUGALS IS AVAILABLE UP TO 240,000 G.P.H. CAPACITY.

THE GORMAN-RUPP COMPANY
MANSFIELD, OHIO

out to date.

From a daily production of four barrels of distillate and about one million cubic feet of gas, production from the treated well increased to betwen 400 and 500 barrels of high gravity crude oil per day. The pay zone treated was the Springer sandstone, a formation at the base of the Pennsylvanian series, which operators said was hard and tight.

The magnitude of this particular operation can be judged by comparing it with the usual fracturing job in which from 1000 to 10,000 pounds of sand is used. Normally a sand fracturing job requires from three to four hours to complete. It required more than 13 hours to complete the injection of the fracturing agents in this job.

The well treated was Sun Drilling Company's Miller 8, located in the SW NW SW of Sec. 8-1s-3w in the Tatums pool, Carter County, in Southern Oklahoma. Hole was drilled to 6,199 feet, total depth, and 5½-inch production string set and cemented at 6,197 feet. Casing was perforated at 5,900-52 feet opposite the pay.

Bethlehem Supply Company Opens New Store in Texas

Bethlehem Supply Company has announced the opening of the latest modern supply store at Whitesboro, Texas. The new store is staffed with trained personnel and will maintain stock of drilling and production, refinery and pipe line materials.

C. W. Nichols, formerly field representative at the Odessa, Texas, store is the new store manager and the store is under the supervision of W. E. Stephenson, district manager at Wichita Falls, Texas.

Nordberg Manufacturing Names Feichtmann to District Manager

Appointment of H. J. Feichtmann, Nordberg sales engineer as district manager, Heavy Machinery Division, North Central Territory, has been announced. Feichtmann succeeds E. C. Brooks, former district manager now retired, and will serve Nordberg customers in northwestern Wisconsin, Minnesota, the Dakotas, Wyoming and eastern Montana. He will work out of the home office in Milwaukee.

H. J. Feichtmann

Feichtmann was employed by International Harvester in the Research and Development Laboratory in Chicago. In 1948 he joined Nordberg as an engineer on the diesel engine erection and test floor and was appointed sales engineer in 1949. After recall to military service Feichtmann returned to Nordberg in 1952 and resumed his position as sales engineer.

Welex Jet Services Names Vaughan Vice President

Jack B. Vaughan, who has been associated with Welex Jet Services, Inc., since 1952, was named vice president-sales and operations.

Vaughan was formerly general sales manager. He has been associated with service and drilling companies for a number of years prior to joining Welex.

PUT OIL TO WORK with SIMPLEX HYDRAULIC JACKS and PULLERS

- Pull Bits, Casings, Valve Seats, Bushings, Wheels
- Lift and Skid Rigs, Machinery
- Bend or Straighten Pipe

SIMPLEX Hydraulic Jacks
Single and double pump models from 3 to 100 tons capacity.

SIMPLEX - Jenny Hydraulic Pullers
"Center-Hole". Pulls or pushes. Models 30 — 100 tons capacity.

Re-Mo-Trol Remote Control Puller

Safer to use, operates in tight spots. For pushing or pulling. "Center-Hole" on rams over 30 tons. 10-100 tons capacities.

WRITE FOR COMPLETE INFORMATION . . .

Simplex Jacks

TEMPLETON, KENLY & CO.
2549 Gardner Road, Broadview, Ill.
A. C. TEMPLETON—5627 Del Roy Drive, Dallas, Texas

SERVICE is important, too!
WISCONSIN HEAVY-DUTY Air-Cooled ENGINE
Service Facilities are Second to None

Wherever oil is pumped from wells, the chances are you'll find a Wisconsin Air-Cooled Engine service station nearby, like this one at the Davenport Equipment Co., Odessa, Texas.

Couple excellent servicing with these features and you have ample reasons why Wisconsin Engines rank first in the oil fields. Wisconsin Engines offer you "Most H.P. Hours" of power service through such rugged, heavy-duty features as tapered roller bearings at *both* ends of the shaft. Also, you get all-weather operating dependability through fool-proof air-cooling.

Consult Harley Sales Co. for the name and address of your nearest authorized Wisconsin Engine Sales and Service dealer.

WISCONSIN MOTOR Corporation
MILWAUKEE 46, WISCONSIN
World's Largest Builders of Heavy-Duty Air-Cooled Engines

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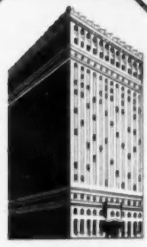
M & M BUILDING, HOUSTON, TEXAS
505 SOUTH MAIN ST., WICHITA, KANSAS
OIL FIELD DISTRIBUTORS FOR WISCONSIN ENGINES AND ALL TYPES OF UTILITY UNITS.

BUSINESS and Pleasure in TULSA means-



- AIR-CONDITIONED COMFORT
- CENTRAL LOCATION
- CONVENIENT COFFEE SHOP
- NEW MODERN ADJOINING GARAGE

THE MAYO
TULSA'S FINEST HOTEL
Home of the Popular Terrace Room

CLARK UTILITRUCS handle the toughest jobs at least cost!

...they're engineered to satisfy driver, maintenance man, management

Here are the most advanced 6000-7000 lb. fork trucks on the market today—Clark's gas or electric UTILITRUCS. Built to handle jobs that break the backs of less rugged trucks, these UTILITRUCS have proved their superiority in foundries, steel mills, stevedoring* and heavy warehousing. They represent an ideal balance of essential engineering features. They get more work done at less cost, for these reasons:

1. Easier to drive

All controls at the driver's fingertips, like an automobile; compact and more maneuverable; shockless steering; increased braking efficiency; 140 sq. inches additional visibility; 25 inches of free-lift; DYNATORK or HYDRATORK DRIVE available on gas model.

2. Easier to service

Complete accessibility for maintenance. On gas model: one-piece "zipper" hood folds back to expose engine; one-piece floorboard lifts up to expose master cylinder and transmission; swing-out battery. All service points easy to reach.

3. Built to take punishment

Welded, integral-unit box frame eliminates distortion; higher inch-pound rating; axle-to-frame mounting absorbs shocks and strains; new design wheel and backing plate seals out dirt and abrasives. Oil bath air cleaner and oil filter standard on gas model. Totally-enclosed drive motor, sealed-for-life bearings on electric model.

We invite you to compare the UTILITRUCS to any 6000-7000 lb. truck on the market! Without obligation, you can discuss them with your nearby Clark dealer, listed in the Yellow Pages of your phone book. Or write us for free descriptive literature.

*Special stevedoring model available

CLARK EQUIPMENT

Industrial Truck Division
CLARK EQUIPMENT COMPANY
Battle Creek 163, Michigan

Everett W. Lundy

Robert H. Hull

Everett W. Lundy Receives Promotion in Pump Firm

Announcement is made of the appointment of Everett W. Lundy, to assistant sales manager, Peerless Pump Division, Food Machinery and Chemical Corporation, Los Angeles.

Lundy, previously Pacific district manager for the pump firm, will be succeeded by Robert H. Hull, presently Peerless' Central district manager at Indianapolis. Hull, in turn, will be succeeded by Waldo T. Harman, Peerless' Chicago branch office manager.

Lundy attended the University of California at Berkeley, class of 1925. Since graduation he has been identified in sales work with various manufacturers of engineered products, associating himself with the Peerless Pump organization in 1940. Successive promotion from sales engineer to branch office manager at Phoenix to Pacific district sales manager is now climaxed with his appointment to the newly created position of assistant divisional sales manager.

Caterpillar Tractor Announces Decentralization Project

Further decentralization of engineering functions with corresponding new duties for certain Engineering department personnel, has been annnounced by Caterpillar Tractor Co., Peoria, Ill. These changes are due to the company's growth of recent years into a multi-plant operation.

To coordinate the program of all engineering groups serving the various plants and divisions of the company will be the responsibility of G. E. (Ed) Burks who becomes director of engineering.

John E. Jass will succeed Burke as chief engineer of the Peoria plant. Paul B. Benner will become assistant chief engineer at the Peoria plant with supervision over design of motor graders and wheel tractors. Carl L. Kepner will become assistant chief engineer with supervision of earthmoving equipment now manufactured at the Joliet plant.

L-K Pump Valves Company Names Huggins Purchasing Agent

The L-K Pump Valve Company of Houston has announced the appointment of J. H. Huggins to the positions of purchasing agent and advertising manager. Huggins has represented the company in sales engineering since 1946.

A native of Houston, Huggins attended Tulane University and graduated with a mechanical enginering degree from the University of Houston.

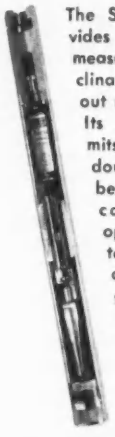
INCLINATION ONLY?

INCLINATION and DIRECTION?

INCLINATION and DIRECTION IN CASED HOLES?

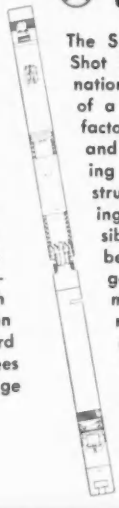
SPERRY-SUN HAS THE *RIGHT* INSTRUMENT FOR EACH JOB

E-C INCLINOMETER



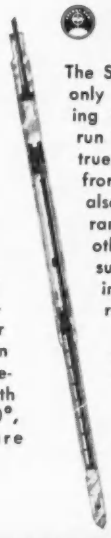
The Sperry-Sun E-C provides a fast, accurate measurement of the inclination of a hole without reference to direction. Its unique principle permits self checking and double checking. It may be run on a wire line or can be go-deviled. It operates on dry cell batteries and is the only inclination instrument which gives multiple records on a single trip. The record reads directly in degrees off vertical within a range of 6 degrees.

SINGLE SHOT



The Sperry-Sun Single Shot measures the inclination and the direction of a hole. It prints both factors on a photo disc and will give a valid reading only when the instrument is at rest, making false readings impossible. The Single Shot may be run on a wire line or go-deviled into a nonmagnetic drill collar or run on a wire line in open hole. Interchangeable angle units with ranges from 0°-20°, 0°-40°, 0°-90° are available.

SURWEL



The Sperry-Sun Surwel is the only directional well surveying instrument that can be run in cased holes and give true gyro-compass bearings from top to bottom. It may also be used where subterranean heat is so great that other instruments fail. Surwel surveys are fully computed, including vertical depth correction.

The Surwel instrument is a small gyro-compass, unaffected by masses of steel or other magnetic influences. It is operated by specially trained Sperry-Sun technicians and arrangements for surveys may be made through any Sperry-Sun office.

SPERRY-SUN OFFICES

You can depend on Sperry-Sun specialists to keep instruments accurately calibrated and to be on the job when needed. Call the Sperry-Sun office in your area for immediate service.

Houston, Texas
Corpus Christi, Texas
Marshall, Texas
Odessa, Texas
Oklahoma City, Okla.
Lafayette, La.
Long Beach, Calif.
Bakersfield, Calif.
Ventura, Calif.
Casper, Wyoming
Farmington, N. M.
Philadelphia, Pa.
International Gas Lift., S.A.
Caracas, Venezuela
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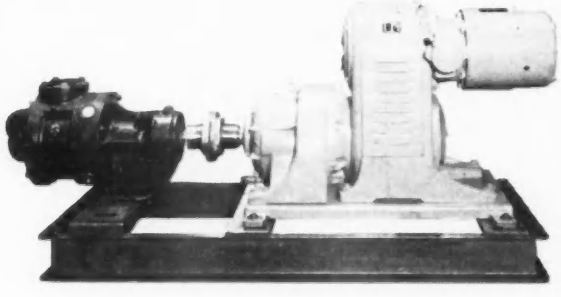
SPERRY-SUN WELL SURVEYING COMPANY

3118 BLODGETT AVENUE • HOUSTON, TEXAS

An Interesting VIKING Unit



Viking Pumps are leaders in service to the Oil Industry . . . tops in performance and dependability.

Shown here is a versatile unit of the heavy-duty style designed to handle thin or viscous liquids. Capacity ranges from 10 GPM to 1050 GPM with pressure to 200 lbs. This unit shows totally enclosed vari-drive with a wide speed range.

We invite your inquiries—

Distributor

SOUTHERN ENGINE & PUMP COMPANY

MANUFACTURERS • MACHINERY FACTORS • CONTRACTORS

Houston — Dallas — Kilgore — San Antonio — Edinburg — Corpus Christi, Texas — Houma and New Orleans, La.

FOR SWABBING

AUTO-RELEASE WIRE LINE STRIPPER

Finest in the field. King Strippers represent outstanding advances in design and construction that assure long life and maximum operating efficiency:

- POSITIVE LATCH will not release by accident or surge of pressure.
- SURE RELEASE MECHANISM operated by rope socket striking bottom of the stripper.
- NON-SPARKING MATERIALS minimize fire hazard.
- ROLLER WIRE LINE GUIDES on hardened steel pins.
- SIDE OPENINGS for inserting packing while line is in the hole.
- PACKING IS SELF-CENTERING; compression screws need not be evenly adjusted.

Export: R. S. STOKVIS & SONS
17 Battery Place, New York 4, N. Y.

KING OIL TOOLS

210 TERMINAL ST. HOUSTON 20, TEXAS OSage 3-3421

Bank of Montreal Appoints Representative in Calgary

J. A. Richards, attached to the Bank of Montreal's superintendent's department, Calgary, for the past two years, has been appointed special representative in Calgary. He will be in charge of the bank's business development in the oil fields of Alberta.

Richards joined the Bank of Montreal in his home town of Edmonton, in 1929. Since that time, he has spent most of his banking career in Alberta.

Hutchison Joins Division Of Continental Supply

Jerry Hutchison has joined the Tubular Sales Division of The Continental Supply Company and will specialize in Fibercast and plastic pipe sales.

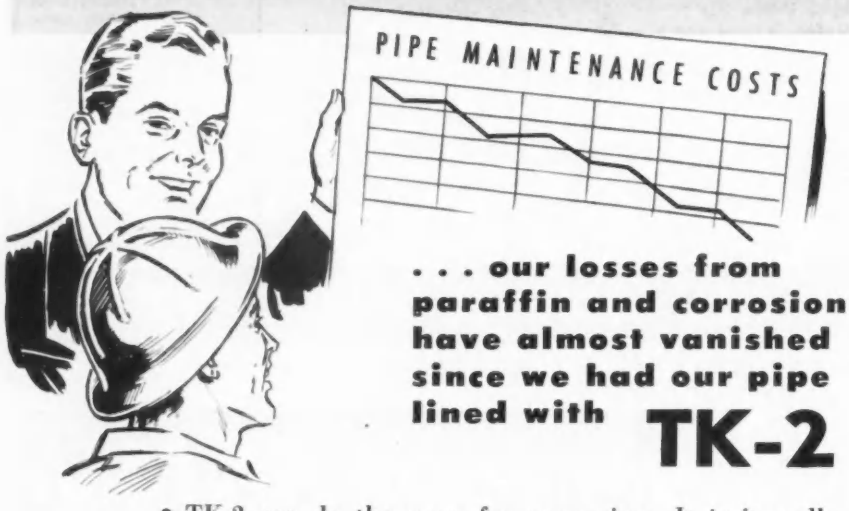
Hutchison, who will work out of Continental's division headquarters in Tulsa, has been active in Fibercast pipe sales since 1947. A native of Fort Madison, Iowa, Hutchison is an engineering graduate of Oklahoma A & M College.

Lane-Wells Establishes Several New Sales Offices

Lane-Wells Canadian Company has opened a new sales office in Regina, Saskatchewan, Canada. Ray E. Benjamin, geologist, is in charge of the office, located at 1913 South Railway Street.

Lane-Wells also has established a truck station at Graham, Texas, with W. D. Capper as station superintendent. A district sales office has been established at 910 Carondolet Building in downtown New Orleans, La. W. B. Vice, Jr., is in charge.

"HERE'S THE INSIDE DOPE!"



. . . our losses from paraffin and corrosion have almost vanished since we had our pipe lined with TK-2

• TK-2 can do the same for your pipe. It isn't really "dope" (although field men who have used 7 million feet of it often call it that) . . . TK-2 is a baked-on plastic, chiefly phenol formaldehyde resin. Tube-Kote experts apply it to the inside or outside of tubing, rods, or other metal equipment.

TK-2 works where other corrosion-resistant materials can't: in wells on packer or with storm chokes, in high-pressure wells or in offshore and other isolated spots. Producers, pipeliners, drillers, refiners, and chemical men know that paraffin won't accumulate and corrosion won't do damage when pipe has the long-life protection of TK-2. Try it and see!

WRITE TODAY FOR THIS DATA BOOKLET

which tells all about TK-2. It gives case histories, chemical data, and describes method of applying. Or see page 4979 in your Composite Catalog.

TUBE-KOTE, INC.
P. O. Box 20037
Houston 25, Texas

TUBE-KOTE
First Name In Corrosion Resistance

TUBE-KOTE T.M. Reg.

Security Engineering Names Bentson Chief Sales Engineer

Hal G. Bentson has been promoted to the newly created position of chief sales engineer for Security Engineering Division, Whittier, Calif.

Hal G. Bentson

Bentson, who assumes his new duties immediately, was formerly assistant chief engineer for the company. In his new position, he will devote a major share of his time assisting oil companies and drilling contractors in solving production problems.

Bentson joined Security in 1938, following his graduation from the University of California, where he obtained his degree in mechanical engineering. He has worked with drilling and production tools in Research, Development, Design, and Field Engineering departments, and has had considerable experience with oil well production problems. He is a registered professional engineer and is on the standardization sub-committee of the American Petroleum Institute.

Sales Engineer Joins Staff Of Macco Oil Tool Company

William B. Adair

William B. (Ben) Adair has accepted a position as sales engineer in gas lift with Macco Oil Tool Company, Houston, manufacturers and distributors of nationally known and accepted gas lift equipment. Adair will be located in the Houston office area as a sales engineer.

Formerly Adair was with Associated Engineers in Houston, joining the firm after graduation in petroleum engineering from The University of Texas in 1951.

Black, Sivalls & Bryson Names Cwik District Sales Manager

Dick Cwik has been named Chicago district sales manager for the Oilfield Sales and the Controls, Safety Head, and Venting Equipment Sales Divisions of Black, Sivalls & Bryson, Inc.

Cwik has been with the company for five years as a salesman and as a city sales manager. In his new capacity, he will have supervision of sales and service activities of the Oilfield Division and the Controls, Safety Head and Venting Equipment Division in the Chicago sales district. Cwik's offices are in the La Salle-Wacker Building.

Seachris Named Sales Manager Of Acme Oil Tool Company

O. L. (Tony) Seachris was recently named sales manager of the Acme Oil Tool Company. Seachris has many years of oil field experience behind him, having spent 15 years as a driller and tool pusher, and six years as a fishing tool operator in Oklahoma, Kansas and North Texas. Outside of his years as an independent operator, most of his experience has been with Acme.

EXCLUSIVE "O" PRINCIPLE

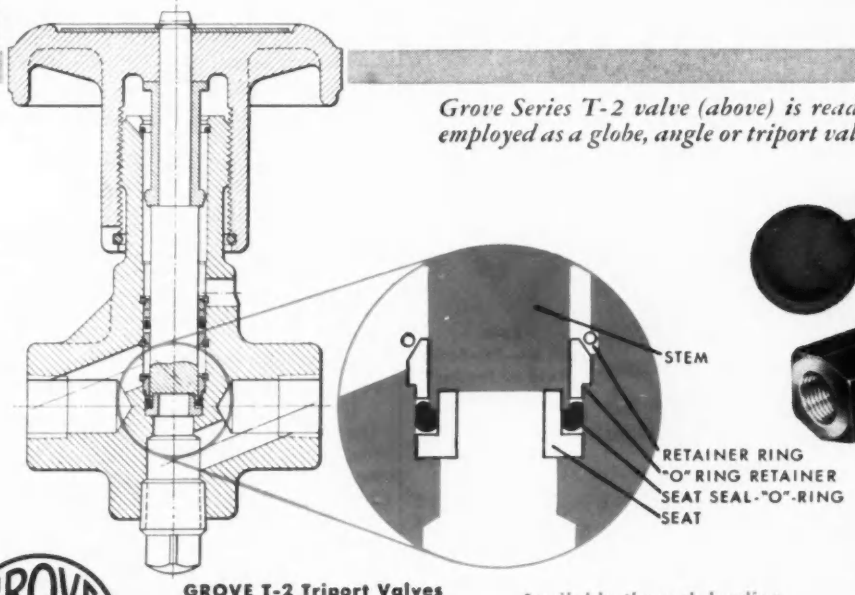
SEAL-"O"-RING

in GROVE TRIPORT VALVES and GAUGE COCKS

for meter manifolds, gauge lines, blowdown and other services

Employing the same basic SEAL-"O"-RING Principle as Grove Gate Valves, the Grove T-2 triport valves and gauge cocks utilize resilient "O" Ring seals to provide bubble tight shut off for flow in either direction. Stem slides open or closed without turning. Handwheel operates with maximum smoothness and ease on non-fouling external threads of integral bonnet. Other features make Grove T-2 SEAL-"O"-RING Valves most dependable for long trouble-free service. Investigate fully today.

Grove Series T-2 valve (above) is readily employed as a globe, angle or triport valve.



GROVE T-2 Gauge Cocks available in ½" Globe or Angle for 10,000 psi.

GROVE SEAL-"O"-RING GATE VALVES—the latest advancement in gate valve design. Fully described in New Bulletin No. G-53. Send for your copy today.

GROVE SEAL-"O"-RING VALVES

GROVE T-2 Triport Valves available in ¼" and ½" for 3,000, 5,000 and 10,000 psi.

Available through leading Oil Field Supply Stores

GROVE SEAL-"O"-RING VALVES

GROVE REGULATOR COMPANY • 65th & Hollis Sts., Oakland 8, California

HOUSTON 4—1901 Calumet St. • **LOS ANGELES 14**—649 So. Olive St. • **NEW YORK 17**—415 Lexington Ave.

CORPUS CHRISTI, TEXAS	ODESSA, TEXAS	DALLAS, TEXAS	TULSA, OKLAHOMA	LAFAYETTE, LOUISIANA	DENVER, COLORADO
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ROLO WELLCHECKERS

PERMANENT AND PORTABLE SEPARATORS FOR METERING OIL AND GAS

A SPECIAL UNIT for WATER FLOOD PROJECTS

or for fields making considerable water and little, if any, gas

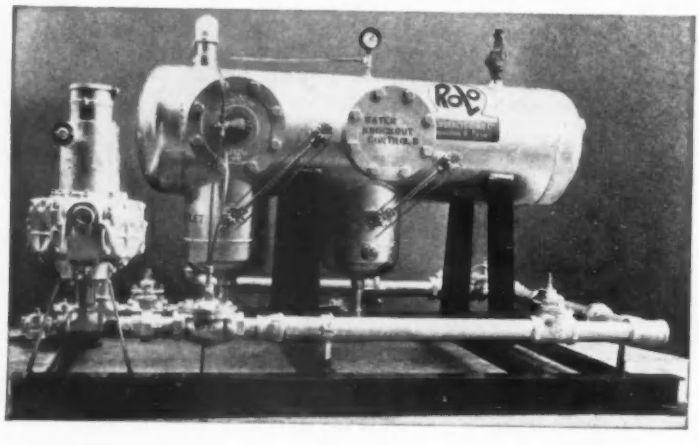
Special built-in gas eliminator to remove up to 60,000 SCFD.

ROLO No. 1H-3006-FWKO 30" O.D. x 5' s to s. x 125 psi. w.p.

The Rolo No. 1H-3006-FWKO Wellchecker, shown above, was especially designed for testing in "water flood projects" and in fields where little or no gas is produced.

This Rolo Free Water Knockout Separator is available in a number of different sizes, with special built-in gas eliminator. Free water is removed from bottom of unit, oil from the top, and all gas is taken off from the special eliminator.

Wellchecker No. 1H-3006-FWKO has a rated liquid capacity of 900 BPD, with ten minute retention time, 60,000 SCFD.



Rolo No. 4—1H-1604 Skid or Trailer Mounted

This unit has a separator 16" x 4' x 125# w.p., API-ASME code-labeled to handle prorated wells and small strippers. It efficiently handles from 5 to 400 bbls. per day with a maximum of 200,000 cu. ft. of gas. May be equipped with automatic water knockout, where free water is prevalent. Designed to sell for considerably less than $1000 (completely piped with oil meter), this unit enables the operator to check his well production daily and to secure accurate records for royalties and taxes. Rolo Wellcheckers are made in all sizes to fit any operation.

Complete engineering services for every crude oil metering need. Consult us on your specific problems. Write today for illustrated catalog, with descriptions of all Wellchecker units, made ONLY by Rolo.

Crude Oil Metering Specialists

ROLO MANUFACTURING COMPANY

P. O. Box 6763, Houston 5, Texas

Branches: Corpus Christi, Midland, Kilgore, Tulsa, New Orleans, Los Angeles, Bakersfield, Casper, Mt. Vernon, Ill.; Calgary (Alta.)
Petroleum Industry Consultants, Apartado 3992, Caracas, Venezuela.
EXPORT OFFICE: R. S. Stokvis & Sons, Inc., 17 Battery Place, New York, N. Y.

Emsco to Make and Market Ball Bearing Swivel Fittings

In a trend to wider diversification of the Emsco line of oil field and related products, the addition of a Swivel Fitting department has been announced by Emsco Manufacturing Company. Emsco has acquired the swivel fitting business of the Rasmussen Manufacturing Company of Hollydale, Calif. These fittings, formerly sold by them under the trade name Ramsco, will be known as Emsco swivel fittings.

E. R. Atkins

Heading the sales program will be E. R. (Pop) Atkins, who has been associated with the manufacture and sale of swivel joints, rotary heads and rotary pressure hose for both domestic and export markets. Atkins will make his headquarters at the Los Angeles plant of the Emsco Manufacturing Company.

Hilker Elected President Of Industrial Editors Group

F. C. (Bud) Hilker, public relations and advertising manager for the Eastman Oil Well Survey Company at Denver, Colo., was elected national president of the Society of Associated Industrial Editors at the organization's convention held in Omaha, September 23-25.

F. C. Hilker

Hilker, who has been associated with the Eastman company since 1948, is publications director for the company and has been active in SAIE in Denver for several years and is a past president of the Colorado editors' group.

His other activities in the oil industry include memberships in the Association of Petroleum Writers and he also serves on the Rocky Mountain District Committee of the OIIC in Denver.

Leonard Named Works Manager For the National Supply

George S. Leonard, plant manager of The National Supply Company at Houston, has been promoted to works manager. He will have primary responsibility for all manufacturing facilities at the Houston plant, which produces wellhead equipment for the oil industry. National Supply also has five other plants for the manufacture of oil field machinery and equipment and has announced plans for an additional plant near Gainesville, Texas.

George S. Leonard

Leonard joined the company in 1936 following his graduation with a B. S. in mechanical engineering at Texas A. & M. College. After field service in Texas and Illinois, he was employed at the Toledo plant prior to being transferred to Houston. He became plant manager in 1948.

V. J. Mercier

R. N. Brammer

Mercier and Brammer Join Staff of Western Company

V. J. (Mike) Mercier and R. N. (Dick) Brammer have joined the sales staff of The Western Company, technical oil well servicing company with general offices in Midland, Texas.

Mercier has been assigned to the Odessa area as a field salesman and will handle sales of both pumping and wire line service for Western. He is an electrical engineering graduate of the University of Missouri and has had 15 years experience in radioactivity well logging, perforating and seismograph survey work. Mercier will be located in Odessa.

Brammer, a petroleum engineering graduate of the University of Oklahoma, has had several years experience in the oil and gas fields of Western Kansas and Oklahoma Panhandle.

In his new assignment, Brammer will represent Western in the sale of the company's acidizing and fracturizing services in the Borger area. He will office at Western's Borger station.

Minneapolis-Honeywell Opens New Dallas Office-Warehouse

A new 13,000 square foot sales office and warehouse has been opened in Dallas by Minneapolis-Honeywell Regulator Company. It will house the company's southwestern regional office which serves Texas, Oklahoma, Kansas and parts of Louisiana, Mississippi, Arkansas, Missouri and New Mexico.

The building also will be headquarters for Honeywell's branch sales office serving northern Texas and northern Louisiana. Fred C. Brandt is the Dallas regional manager.

United States Steel Promotes Phair to Assistant Manager

Milton W. Phair has been appointed assistant manager of sales at the Houston District Sales Office of the United States Steel Corporation's Tennessee Coal and Iron Division.

An employe of United States Steel for 26 years, Phair has worked in the Houston district office since 1933, when he was transferred to TCI from the Carnegie-Illinois Steel Corporation. He began as a stenographer and advanced through the positions of clerk, correspondent and senior correspondent, becoming a salesman in 1947.

American Cynamid Company Names Kohlman to Post

Appointment of Clem W. Kohlman as advertising manager of the Indusrial Chemicals Division of American Cyanamid Company has been announced.

Kohlman, who previously directed advertising and sales promotion for the Tex-

Give yourself the

Unbeatable Performance

of the RIDGID

Heavy-Duty Pipe Wrench

If this Housing ever Breaks or Distorts we will replace it Free
THE RIDGE TOOL CO.
ELYRIA, O.
14
HEAVY DUTY
RIDGID
"RIDGID" means most service for your money!

Every RIDGID Wrench Factory-Tested

That's what makes sure that every RIDGID performs as you've learned to expect...*every* part inspected, *every* wrench pipe tested 100%! Only RIDGID's housing is unconditionally guaranteed, saving you bother and expense. Full-floating hookjaw, adjusting nut spins easily in all sizes, 6″ to 60″; replaceable alloy jaws, handy pipe scale on hookjaw, comfort-grip I-beam handle. For most service for your money, buy RIDGID's . . . at your Supply House.

THE RIDGE TOOL COMPANY • ELYRIA, OHIO, U.S.A.

RIDGID

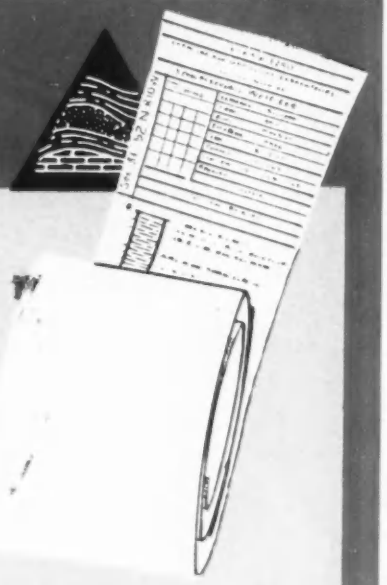
Work-Saver Pipe Tools

footage described... increased 28%

cost per log... decreased 45%

on chem lab's

WELL-LOGGING SERVICE



The most valuable function of Chem Lab's geological department is its monthly stratigraphic well logging service, which is used by almost all of the major operators and many independents in the Rocky Mountain Area. The wealth of data accumulated has proved to be extremely valuable to both old and new operators in this area.

Since this service was started in 1947 the monthly fee has remained the same ... but, the average number of logs per month has approximately doubled; the total footage described per year has increased from 362,000 to 464,000; the average cost per log has decreased from $31.03 to $21.43; the average cost per one hundred feet has decreased from $0.50 to $0.39.

WRITE or CALL, now, for complete data

SEE CHEM LAB

for fully integrated chemical, engineering and geological services

CHEMICAL & GEOLOGICAL LABORATORIES

Laboratories at Casper, Midland, Glendive, Edmonton, Calgary and Regina

tile Resin Department of American Cyanamid Company, will be in charge of advertising and sales promotion for the six departments in the Industrial Chemicals Division—Paper Chemicals, Refinery Chemicals, Manufacturers Chemicals, Heavy Chemicals, Leather and Miscellaneous Chemicals.

A. M. Asherman will be assistant advertising manager of the division.

E. W. Forrow Joins Kobe As Manager–Perforated Sales

E. W. (Al) Forrow has been named manager of perforated sales for Kobe, Inc., division of Dresser Equipment Company. Forrow has been in the oil well equipment business since 1919, starting with Union Oil Company in Orcutt, Calif.

E. W. (Al) Forrow

One of the first members of the Security Engineering Company staff, Forrow spent 11 years with the firm, filling the position of vice president and sales manager. He also has been associated with E. B. Wiggins Oil Tool Company, during which time he invented the Wiggins reamer, and held management positions with Byron Jackson, Harvey Machine Company and Power Rig and Equipment Company.

Forrow will have headquarters at the company's perforating plant at Long Beach, Calif.

American Mfg. Company of Texas Opens Branch Office in Canada

American Mfg. Co. of Texas has announced the opening of a new branch office in Canada at 616 Lancaster Building, Calgary, Alberta. M. A. (Hoot) Priester has been appointed sales representative for Canada and will be in charge of this office. This company makes and distributes an extensive line of oil field equipment, pumping units, pipe products, and other items. Home offices are in Fort Worth, Texas, with other branches in New York, Tulsa, Okla., and in Texas at Houston, Odessa, and Kilgore.

Priester joined the American Mfg. Co. of Texas as a mechanic in 1942. He served as a truck driver and for the last two and one half years he has been a service man. In recognition of his knowledge of the field, the company's products, and preparation and qualification for advancement, he was promoted to sales representative for Canada. Sales and service for American products in Canada will be handled through Priester's office in Calgary.

Elliott To Head Market Research For Axelson Manufacturing

Bruce C. Elliott has been appointed head of the newly-formed Axelson Market Research department of Axelson Manufacturing Company Division of Pressed Steel Car Company, Inc.

Elliott has been with the Axelson Aircraft Sales Division since 1949. In his new position, Elliott will be in charge of research activities for aircraft, petroleum equipment, lathe and foundry divisions.

United States Steel Division Appoints Research Director

William M. Frame has been appointed director of research and technology by United States Steel Corporation's National Tube Division. Frame succeeds O. P. Adams, who is retiring.

William M. Frame

Since joining U. S. Steel's National Tube Division in 1952, Frame has been executive assistant, Operating department. He began his career in the steel industry as a metallurgical engineer for Central Alloy Steel Company in 1928. Later he was assistant chief engineer for the Otis Steel Company and joined Spang-Chalfant Company in 1932, serving as research and development engineer, director of research, assistant to the vice president-operations, and works manager at the Ambridge, Penn., pipe mills.

Cooper-Bessemer Names Alcorn To Foreign Sales Office

The promotion of John Alcorn to Cooper-Bessemer's foreign sales office has been announced. In his new capacity, Alcorn will be assistant to M. Pollock, president of Cooper-Bessemer Overseas, Cooper-Bessemer International and Cooper-Bessemer of Canada, Ltd. with offices in New York City.

John Alcorn

Alcorn formerly was associated with the Ford Motor Company and the Chrysler Corporation. During recent years at Cooper-Bessemer, he has been responsible for the application enginering of gas engine-driven and motor-driven compressors.

Graver Tank & Mfg. Company Forms New Sales Division

Graver Tank & Mfg. Co., Inc. has announced the formation of a separate division for the sales and service of oilfield equipment. Known as the Graver Supply Co., this division is under the direction of J. E. Fogarty, mid-continent area manager for Graver's plants in Sand Springs, Okla., and Odessa, Texas. As general manager of the new Graver Supply Co., Fogarty has established sales offices and storage yards in a number of cities throughout the Southwest.

J. E. Fogarty

An engineering graduate of Purdue University, Fogarty has directed Graver's mid-continent fabricating and sales since Graver acquired its Oklahoma plant in 1946. His long experience includes plant supervision at Mt. Vernon, Ill., and at Graver's main plant at East Chicago, Ind.

Gerald G. Byer has been appointed area manager for the Oklahoma-Kansas terri-

chem lab's
full diameter corestudy gives
TRUER, MORE REPRESENTATIVE, MORE REALISTIC INFORMATION, FOR ...WILDCAT COMPLETION... RESERVOIR INFORMATION
This Full Diameter Core can measure fractures, cracks, partings, vugs.
This plug cannot measure fractures, cracks, partings, vugs.

HERE'S PROOF from the FILES:

TYPE OF PRODUCING FORMATION: LIMESTONE

METHOD OF ANALYSIS	CONVENTIONAL PLUG	FULL DIA. CORESTUDY
Footage analyzed	54	54
Specimens analyzed	53	46
Total porosity—feet	591	518
Total millidarcy—feet	628	2,533
Footage of 0.1 millidarcy & higher	44	46
Total volume of specimen analyzed in cu. inches	42.6	2,290.7
Cost of analysis (porosity and permeability)	$210.50	$296.00

RESULT: Full Diameter Corestudy analyzed 53 times more volume of specimen for only $85.00 additional cost.

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CHEMICAL & GEOLOGICAL LABORATORIES

Laboratories at Casper, Midland, Glendive, Edmonton, Calgary and Regina

tory and has set up offices in Tulsa. His twin sons, George and Jerry, are manning branch offices in Oklahoma City and Great Bend, Kansas, respectively. Henry F. McCabe covers the district around Ardmore, Okla. Yards for service and storage have been selected in both Ardmore and Great Bend.

A second sales area covers West Texas and New Mexico, headed by J. E. Hobson at Odessa, where Graver recently located a fabricating plant under G. W. Mayer as superintendent. Hobson is assisted by A. T. Arnold at Odessa and by subordinate sales offices in Hobbs, N. M., Abilene and Dallas, Texas. A yard has been purchased in Abilene and other facilities are planned. J. G. Scofield heads the branch office at Hobbs, R. R. Cowan at Abilene and M. J. Bridges in Dallas.

For the Gulf Coast area, arrangements have been made for the marketing of Graver-built well-head equipment from Houston as a center, through the Murphy Tank Co. of which E. G. Murphy is president. To provide immediate service, a large storage yard is already in operation at Houston.

The new Graver Supply Co. will market Graver-built lease tanks, both welded and bolted, walkways and stairways, oil and gas separators, and heaters.

Aero Service Corporation Establishes New Firm

The establishment of Aero Service Corp. (Mid-Continent) at Tulsa has been announced by Aero Service Corporation, Philadelphia, the parent company. The new organization, formerly Frost Airborne Surveys Corp., will expand services in aerial exploration and mapping service in the central United States. In addition to airborne magnetometer surveys for oil and minerals, Aero (Mid-Continent) will perform photogeologic studies, photo-mapping, topographic mapping and other geophysical and photogrammetric services.

Personnel of the Frost organization has been retained in the new company. J. C. Rollins will head the Sales department and Al Ibach will be in charge of production. C. H. Frost is available as a consultant and William B. Agocs, formerly head of the Department of Geophysics of the University of Tulsa and presently chief geophysicist for the parent firm, will be available as consultant in geophysical matters.

Aero Service Corp. (Mid-Continent) is now part of the Aero worldwide aerial mapping and exploration group. Affiliate companies are Canadian Aero Services, Ltd., and Spartan Air Services, Ltd., Ottawa; Aero Service Corp. (Western), Salt Lake City; International Aero Service Corp. and Worldwide Surveys, Inc., and the parent firm, Aero Service Corporation.

A. M. Birnie Completes Tour Of Mexican Oil Fields

Recently returned from a tour of Mexican oil fields is A. M. Birnie, general sales manager for Security Engineering Division, Dresser Operations, Inc. Birnie, whose itinerary included a visit with officials of Pemex, toured the Posa Rica and Tampico oil fields, spending time in each checking Security equipment run in the respective fields.

Commenting on the trip, Birnie pointed out that the Mexican drilling rigs are utilizing every new modern drilling method that has been devised in developing their vast oil deposits. Frank Leonis, western regional sales manager of Security, accompanied Birnie on the Mexican trip.

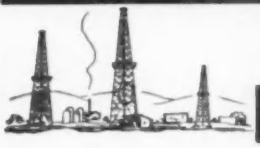
Baker Oil Tools Appoints Mitchell District Manager

Baker Oil Tools, Inc., announces the appointment of Garey W. Mitchell as district manager of the Kansas District.

Mitchell attended Fort Hayes State College at Hayes, Kansas, and joined Baker in 1945. Since that time he has been branch manager of the company's Great Bend, Kansas, branch, and later was appointed sub-district manager of the Mid-Continent District. Mitchell will establish a district office at Wichita.

Clark Equipment Company Names New Dealer in West Virginia

The Clark Equipment Company, Buchanan, Mich., has appointed the Crunkleton Company, Charleston, W. Va., as a distributor of Clark's full line of materials handling equipment, including fork-lift trucks, towing tractors, powered hand trucks, and Ross Carriers. The new dealership is under the management of Leslie D. Crunkleton, Jr.



WORLD OIL'S Trading Post

CLASSIFIED ADVERTISING

RATES: Regular Classified (undisplayed) **set in this size type: 12 cents per word. Minimum charge, $3.** Blind box address in our care counts six words. Replies forwarded without charge. **Situation wanted** ads, 6 cents per word. **Display ads,** set in suitably larger type with ruled **border, $12 per column inch; situation wanted display ads, $6 per column inch. Ten percent discount for two or more insertions of same copy in consecutive issues. All classified ads payable in advance. COPY DEADLINE:** 5th of month preceding date of issue. Send copy and checks to: **Trading Post Section, World Oil, P. O. Box 2608, Houston, Texas.**

SITUATIONS WANTED

Drilling contractor operating in West Texas and New Mexico desires to contact small or medium-sized independent oil company who needs an operating manager. Personal interview desired. Twenty years experience in all phases of the oil industry. Address replies to Box 94-W, WORLD OIL, Houston 1, Texas.

Have five years management experience in fair size oil operation, including exploration, development, production, sale of oil, leases, contracts, etc. Have master's degree petroleum engineering and substantial geological experience. Desire position with small group or independent interested in oil exploration and production. Presently located Rocky Mountain area. Box 4-W, WORLD OIL, P. O. Box 2608, Houston, Texas.

HELP WANTED

Wanted for Employment

Petroleum engineer or geologist with two or three years experience in Louisiana Gulf Coast. Duties will entail preparation and maintenance of detailed structure and Isopach maps of South Louisiana fields and evaluations necessary in field studies. Work located in New Orleans with reliable and financially strong concern. Reply giving age, experience in detail, and salary desired. Inquiries will be kept strictly confidential. Our employees know of this ad. Box 6-W, c/o WORLD OIL, Houston, Texas.

SERVICES

Avoid drilling dry holes.
CARRILLO'S scientific electronic method for oil exploration is a direct technique that accurately locates oil deposits.
Twenty years of research, experience and success is our recommendation.
CARRILLO'S survey puts the drill on the oil.
For information or service, write to CARRILLO, P. O. Box 9685, Station Sanford, Los Angeles 5, California.

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WASHINGTON COMMERCIAL CO., 1200 Fifteenth St. N. W., Washington 5, D. C.

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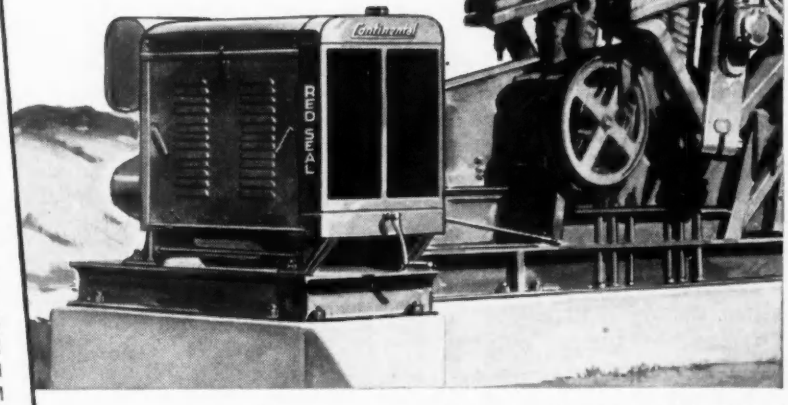

INDUSTRIAL GASOLINE ENGINES

Model	Cyl.	Bore	Stroke	Displ.	Bare Engine H.P.
N56	4	2¼	3½	56	14.2 @ 2200 RPM
N62	4	2⅜	3½	62	15 @ 2200 RPM
Y69	4	2½	3½	69	21.4 @ 2400 RPM
Y91	4	2⅞	3½	91	28.5 @ 2400 RPM
Y112	4	3 3/16	3½	112	32 @ 2400 RPM
F124	4	3	4⅜	124	36 @ 2400 RPM
F140	4	3 3/16	4⅜	140	42 @ 2400 RPM
F162	4	3 7/16	4⅜	162	49 @ 2400 RPM
F186	6	3	4⅜	186	60.5 @ 2400 RPM
F209	6	3 3/16	4⅜	209	68 @ 2400 RPM
F226	6	3 5/16	4⅜	226	73 @ 2400 RPM
F244	6	3 7/16	4⅜	244	79 @ 2400 RPM
M271	6	3⅝	4⅜	271	86.2 @ 2400 RPM
M290	6	3¾	4⅜	290	92.2 @ 2400 RPM
M330	6	4	4⅜	330	104.4 @ 2400 RPM
B371	6	4⅛	4⅝	371	110 @ 2400 RPM
B427	6	4 5/16	4⅞	427	127 @ 2400 RPM
J382	4	4½	6	382	78.3 @ 1500 RPM
G134	4	3⅛	4⅜	134	32.2 @ 2000 RPM
G157	4	3⅜	4⅜	157	37.7 @ 2000 RPM
H227	4	3⅝	5½	227	54 @ 2000 RPM
H243	4	3¾	5½	243	58.2 @ 2000 RPM
*H260	4	3⅞	5½	260	62 @ 2000 RPM
T371	6	4⅛	4⅝	371	119 @ 2400 RPM
T427	6	4 5/16	4⅞	427	140 @ 2400 RPM
U501	6	4½	5¼	501	160 @ 2400 RPM
R513	6	4½	5⅜	513	164.3 @ 2400 RPM
R572	6	4¾	5⅜	572	182.4 @ 2400 RPM
R602	6	4⅞	5⅜	602	191.7 @ 2400 RPM
S749	6	5⅜	5½	749	217 @ 2200 RPM

INDUSTRIAL DIESEL ENGINES

Model	Cyl.	Bore	Stroke	Displ.	Bare Engine H.P.
GD157	4	3⅜	4⅜	157	39 @ 2000 RPM
HD243	4	3¾	5½	243	54.7 @ 2000 RPM
*HD260	4	3⅞	5½	260	59.3 @ 2000 RPM
TD427	6	4 5/16	4⅞	427	106.5 @ 2000 RPM
RD572	6	4¾	5⅜	572	142.5 @ 2000 RPM
SD802	6	5 9/16	5½	802	184.3 @ 1800 RPM

*Available for Industrial applications only.

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GASIFICATION AND LIQUEFACTION OF COAL, American Institute of Mining & Metallurgical Engineers, 29 West 39th Street, New York 18, N. Y. $4.20 to members, $6 to nonmembers.

This volume contains the papers given at the symposium on the gasification and liquefaction of coal held at the annual meeting of the AIME in New York in February, 1952. The volume reflects new and current developments described by research men in operations dealing with improved techniques of gasification plant design, direct hydrogenation, chemicals output, underground gasification and gas economics.

•

MEASUREMENT TECHNIQUES IN MECHANICAL ENGINEERING, R. J. Sweeney, John Wiley & Sons, 440 Fourth Avenue, New York 16, N. Y. $5.50.

This book, which covers the principles that underlie the operation of engines, pumps, compressors, and combustion and heat-transfer apparatus, emphasizes the application of theory to the practical problems met in testing work. Designed for both students and practicing engineers, it explains the fundamentals of instrument design and points out the difficulties involved in obtaining a correct measurement of physical quantities.

•

PIPEFITTERS HANDBOOK, Forrest R. Lindsey, The Industrial Press, 148 Lafayette Street, New York 13, N. Y. $6.

Drag up the bending table and fire up the cutting torch. Here at last is a practical book on pipefitting that is practical. For one thing, it doesn't devote most of its contents to sewer piping and wiping lead joints. The tables save many a perplexing scratch of the head, and there are clear concise directions for laying out templates for mitered joints. For engineers who are laying out piping systems, the book will surely be a time saver.

•

OIL AND PETROLEUM YEARBOOK, 1953, Walter E. Skinner, compiler, 20 Copthall Avenue, London, E.C. 2. $4 net post free abroad.

The 1953 edition of this standard reference work has just been released. Up-to-date information concerning 842 companies operating in all parts of the world and covering all branches of the oil industry are given. The book also includes a list of names and addresses of 567 managers and engineers and the companies in the book with which they are connected. Information is given on the principal British, American Canadian and foreign companies, including names of directors and other officials, descriptions of business, where operating, crude oil production, refinery runs, details of capital, dividends and financial results.

•

OIL IN THE ROCKIES, Petroleum Information, Continental Oil Building, Denver, Colo.

Petroleum Information, Rocky Mountain fact-finding organization for the oil industry, has announced a new service. The service combines a map of the Rocky Mountain region on which progress of all exploratory drilling is noted with a concise review of each month's activities in all phases of the oil industry in the region. "Oil in the Rockies" will be issued monthly as an analysis and forecast of activities in exploration, drilling, refining, and pipelining. It will also present reviews and summaries of outstanding regional operations.

•

EXPLORATION GEOPHYSICS, Dr. J. J. Jakosky, International Geophysics, Inc., 1063 Gayley Avenue, Los Angeles, 5, Calif.

This widely used textbook written by the president of International Geophysics, Inc., in collaboration with a number of other nationally recognized authorities on the subject and recently revised is still an essential in every geophysical laboratory or department in the petroleum business. This book covers the field of exploration by modern geophysical methods and constitutes an exposition of what is normally a distinctly complex matter. It has 13 chapters outlining contemporary methods of seismic recording and interpretation as well as the pertinent subjects of permit, trespass and insurance.

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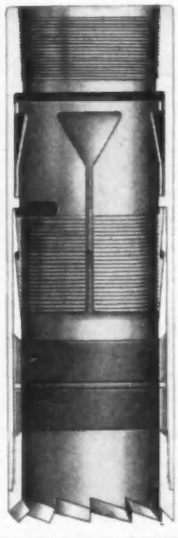
Packer Type Bowen Releasing Casing Bowls are used with great effectiveness in wells with casing difficulties. The standard procedure is to make a cut with an Internal Cutter in the casing immediately below the damaged area and to pull the casing from the hole. The damaged portion of the casing string is then replaced with good casing. A Packer Type Bowen Releasing Casing Bowl is then installed on the bottom end and lowered over the casing in the hole. When upward pull is exerted, the tapers on the Cone contracts the Slips into secure engagements with the casing and the Cone bears against and compresses the lead Packing into a leakproof seal around the casing.



DOES NOT REDUCE HOLE DIAMETER

The bore of this tool is always either the same or larger than the inside diameter of the casing on which it is to run, so that there is no impairment of any inside-the-casing operations.

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Release is effected by bumping down and rotating to the right. This hangs the Slip in its uppermost position. When in this position, the Slip cannot be contracted against the casing by the tapers on the Cone and the tool easily can be withdrawn.

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SQUEAKS from the BULLWHEEL

"Waiter, what's the meaning of this extra 10 cent charge?"

Simple

"I can't understand it," said one college student to another as they worked out in the gymnasium. "When I stand on my head, the blood rushes to my head, but when I stand on my feet the blood doesn't rush to my feet."

"That's not hard to figure out," commented the other. "Your feet aren't empty."

•

You'll Never Know

Under the mistaken impression that it was a sergeant on the other end of the phone, the lieutenant bawled him out unmercifully.

"Do you know whom you are addressing?" was the icy reply.

"No," admitted the lieutenant.

"Well, this is Major Wright."

"Major," said the lieutenant, "do you know whom you are addressing?"

"*NO!*" thundered the major.

"Thank God!" said the lieutenant, and hung up.

•

Synonyms

The motorist who was stopped by a policeman for speeding angrily called the cop an ass. . . . When he paid his fine, the judge reproved him for what he'd said to the cop. "Judge, you mean I shouldn't call a policeman an ass?"

"Certainly not," said the judge. "You must have respect for authority and not insult the police.

"Well, judge," the man went on, "you wouldn't care if I called an ass a policeman, would you?"

The judge pondered this a moment, then his eyes twinkled. "Why, no, I suppose not."

The motorist turned to the officer who had arrested him and said sweetly, "Goodbye, policeman."

Fish Bait

A puzzled little girl watched a party of fishermen putting off in their boat. "But mummy," she asked, "do the fishes like all that beer?"

•

Segregation for a Purpose

"Do you keep the women inmates separated from the men inmates," asked a visitor at the Rainbow's End Rest Home.

"Sure do," answered the attendant. "Some of these peope aren't as crazy as you think."

•

Wrong Weakness

In a crowded train, a salesman sat down beside a young woman who fought a desperate but losing battle to keep her skimpy skirt from creeping up over her knees. After another futile yank, she looked up to meet the gaze of her traveling companion. "Don't stretch your calico, sister," he said, "my weakness is liquor."

•

Stretching the Salary

The clerk in the department store, although receiving a very small salary, was leading a gay life and gave evidence of having much money. The personnel manager finally called him in and asked:

"How is it, young man, that you, who are receiving a salary of only $30 a week, can spend what must certainly amount to over $100? Have you been left a fortune, or what?"

"It's very simple, sir," he replied. "There are more than 200 employees upstairs here and every payday I raffle off my salary at one dollar a ticket."

•

Can't Wait

When the Chicago subway was being dug, a "drunk" stopped beside the excavation and called down to the men at the bottom of the pit: "Shay, watcha doin' down there?"

"We're building a subway," one of the men answered.

"How long is it going to take to build it?"

"Three years," came the answer.

"Three years!" (hic) "To 'ell with it. I'll take a taxi."

•

Handicapped

The family was objecting to their son's girl, insisting that he ought to be a little more particular about the company he kept.

"I'm sorry, Dad," said the boy, "but that's the best girl I can get with the car we've got."

•

Production

A small boy was asked by his father, a well-known industrialist, what he would like to have for Christmas. "A baby brother," replied the boy.

"But it's only two weeks to Christmas," objected the father, "and that doesn't give me enough time."

"I know," said the boy. "But can't you put more men on the job?"

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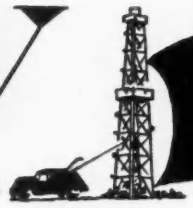

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Well previously perforated by other make bullets and jets without increasing production. After 32 holes shot by improved McCullough Standard Glass Jet, production increased to 158 B/D. Casing: 7", 20 lb. cemented. Depth: 3400 feet.

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Peak Production of 60 B/D had dropped to 20 B/D over a period of years. Well perforated with 1314 improved McCullough M-3 Burrless Bullets, between 6234 and 6544 feet. Casing: 7", 26 lb. cemented.

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Mighty Tasty!

A group of ministers and a salesmen's organization were holding conventions in the same hotel. The catering department had to work at top speed serving dinners to both.

The salesmen were having spiked watermelon for dessert but the harrassed chef discovered this alcoholic tidbit was being served to the ministers by mistake.

"Quick!" he commanded a waiter. "If they haven't eaten the watermelon bring it back and we'll give it to the salesmen."

The waiter returned and reported it was too late—the ministers were eating the dessert.

"Well," demanded the excited chef. "What did they say? How did they like it?"

"Don't know how they liked it," replied the waiter, "but they are putting the seeds in their pockets."

•

Happily Married

"Is your married life a happy one?"

"Yes, I married the woman of my dreams. She is as beautiful to me as the day I met her. Her hands are always white and soft. Her hair is never untidy and her dresses are always the latest."

"So you don't regret it?"

"No, but I'm getting pretty tired of eating in restaurants."

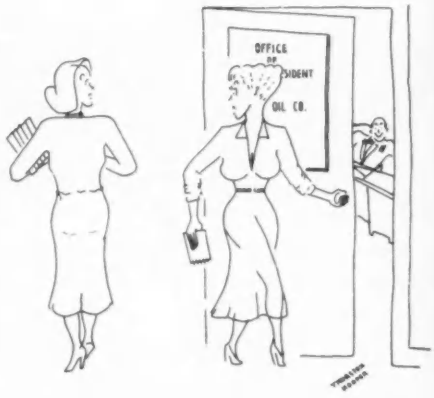
•

Repentance

A drunk staggered home and made his way subconsciously through the house, winding up in the shower of his bathroom. As he groped about, he turned on the water, deluging himself plenty and making a racket which brought the little woman to the scene.

Taking in the details, she called him all kinds of so-and-so, winding up with a none too flattering estimate of his past, present and future.

"That's right, honey," admitted the shuddering sot. "I'm everything you said—and worse. But let me in, won't you? It's raining something awful out here."



And when he says. "Sit down," he doesn't mean for you to go looking for a chair.

Modern Problems

Bobby was celebrating his fourth birthday and Aunt Minnie watched him anxiously as he paced up and down in the kitchen by himself, his face dark with an unexplained worry.

"Anything wrong, dear?" asked the anxious aunt at last.

"Anything wrong?" barked the four-year-old. "Here I am four years old and what have I got to show for it?"

•

Short Life Span

An English soldier in a French village seeing a wedding in progress at a church asked a Frenchman whose wedding it was.

"Je ne sais pas, M'sieu," answered the Frenchman.

A few hours later the same soldier saw a coffin going into the same church and curiosity getting the better of him, he again asked the identity of the individual.

"Je ne sais pas," was the response.

"Blimey!" said the Tommy, "he didn't last long."

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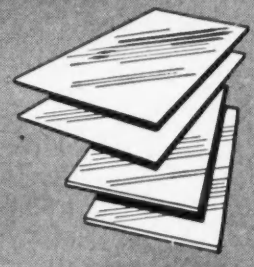
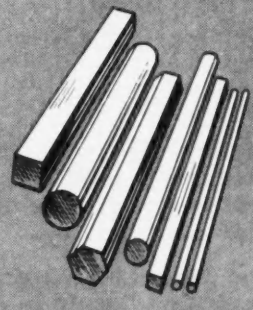


SHEET AND PLATE



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Room Service

Two salesmen found the only hotel in town full. The proprietor told them the best he could do for them was to let them sleep in an abandoned church building across the street. They agreed.

About two o'clock in the morning the church bell began to toll. The hotel owner woke up the bellboy and sent him to see what the trouble was.

"Well, what was the matter?" he anxiously asked the bellboy on his return.

"The party in pew 16 wants a whiskey sour," the bellboy answered.

•

Wars

A youngster asked his father how wars started. "Well," said his father, "suppose America quarreled with England and—"

"But," interrupted the mother, "America must never quarrel with England."

"I know," agreed the father, "but I am only taking a hypothetical instance."

"You are misleading the child," she protested.

"No, I'm not," shouted the father.

"Never mind, Dad," put in the boy, "I think I know how wars start."

•

Deception

A father was very angry about the poor marks on his son's report card. "I wish you wouldn't be so hard on him," soothed his wife. "The boy's trying, and—"

"Oh, it really isn't the marks I mind so much," interrupted the father. "It's the deception. Why the dickens does he have to look so bright?"

•

Sure Thing

The boys from the back room were gathered at the services for a fellow gambler who had passed on.

"Spike," droned the preacher, "is not dead. He is sleeping."

Came the inevitable voice from the rear: "I've got a grand that says he's dead."

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No Amateurs

A widower who was about to be married for the third time, and whose bride-to-be had also been at the altar before, wrote at the bottom of the wedding invitations:

"Don't fail to come. This is no amateur performance."

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Ignorance Is Bliss

A native of Brooklyn was spending his first day on a dude ranch in Nevada. He came back to the bunkhouse with a handful of rattles from an enormous rattlesnake. A ranch hand turned pale when he saw them and said, "Holy smoke, where'd you get hold of those things?"

The Brooklynite couldn't understand the other's agitation; he explained, "I took them offen the biggest woim I ever seen."

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Finders Keepers!

The husband eyed his wife over the hotel dinner table in puzzled surprise:

"That's a beautiful necklace you're wearing, my dear," he said.

"Yes, isn't it, darling?" replied the wife. "I found it in the back of your car."

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